JUNE 1961 3/6

AUTOMATIC DATA PROCESSING

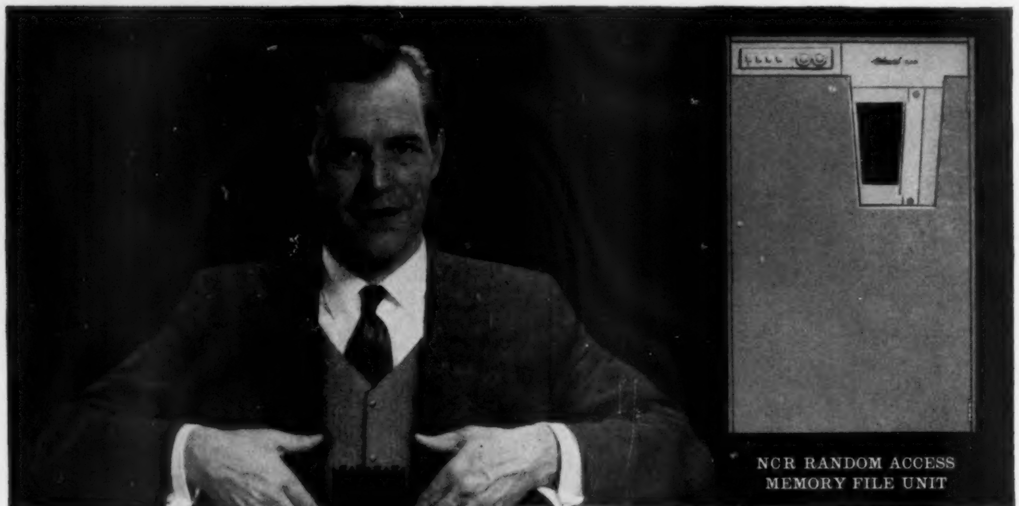
JOURNAL OF MANAGEMENT AND INFORMATION SYSTEMS

No Bristles on Gillette

Fur under the hammer

Information goes on the screen

Counting citizens today



NCR RANDOM ACCESS MEMORY FILE UNIT

This 'card'... ...is the heart of the RANDOM ACCESS MEMORY* of the National 315 BUSINESS DATA PROCESSING COMPUTER.

* an entirely new concept in magnetic memory systems

THIS MAGNETIC CARD is the heart of the **National 315 Random Access Memory** . . . an unparalleled advance in economical magnetic file processing. In effect, a reel of magnetic tape–3¼ inches wide–has been cut into 256 strips forming addressable magnetic cards. A single card is capable of storing 21,700 alpha-numeric characters. Each card contains 7 recording tracks that can be addressed electronically by the central processor. The 256 cards (5,555,200 alpha-numeric characters) are housed in a removable cartridge that can be changed in less time than it takes to change a reel of magnetic tape! Up to 16 Random Access Memory file units can be operated on-line with the National 315... providing 88,883,200 alpha-numeric characters . . . an unprecedented capacity for a Random Access Memory. This unique system combines all the advantages of random and sequential processing . . . eliminates rewind time . . . requires fewer files . . . speeds sorting, up-dating, and reporting routine. **INVESTIGATE THE NATIONAL 315** for investment · Its unusual expansibility · Its high speed · Its balanced processing · Its economy of programming · Its ease of operation.

NCR National

1039 Offices in 121 Countries

Learn why the NATIONAL 315 *is the most advanced electronic data processing system yet developed. Call your* NCR *office or write to* NCR ELECTRONICS, *206–216 Marylebone Road, London NW1. Telephone:* PADdington *7070*

THE NATIONAL CASH REGISTER COMPANY LIMITED

AUTOMATIC
DATA
PROCESSING

JOURNAL OF MANAGEMENT AND INFORMATION SYSTEMS VOL 3 No 6

CONTENTS

JUNE 1961

Price for 12 issues post paid:
United Kingdom and Eire 45s.
USA $6.50
Canada $6.00
Other countries 45s. or Local currency equivalent

AUTOMATIC DATA PROCESSING

is published monthly by Business Publications Ltd.

Advertisement, editorial and sales offices: Mercury House, 109-119 Waterloo Road, London, S.E.1. (Waterloo 3388.)

Change of subscriber's address: Please notify publishers six weeks before change of address is to take effect, giving present address in full and new address.

Editor **Philip Marchand**; Assistant Editor **David Roach Pierson**; Art Editor **Douglas Long**; Advisory Editors **John Diebold MBA, A S Wainman**; Editorial Director **George Copeman PhD**; Advertisement Manager **D G A Shallcross.** Sales Director **J Hinchcliff.**

Court Tactics

At least two, and possibly more, computer manufacturers are currently discovering that success can produce its own problems. Within the span of a few months a score or two of machines are to be delivered in quick succession, and considerable strain is going to be put on maintenance engineering staffs, training personnel, systems advisers and others usually involved in getting an installation under way. This period is likely to underscore a problem that most computer companies as well as their customers experience: the current acute shortage of trained people.

Clearly, there is no short-term answer to this problem, but that should not be allowed to block all thinking on this subject. Prince Philip, in sponsoring and introducing the Commonwealth Technical Training Week, has drawn attention to the national importance of ending the waste of natural skills, and the ball has been, as it were, lobbed into the manufacturers' court—and this, of course, includes the computer companies.

An obvious point to make is that the computer industry is going to have to increase the amount of money it spends on educational programmes; this said, the important thing to decide is how this money is to be spent, for there are a number of alternatives. Individual companies already undertake a great deal of training, and the temptation might be to spend a little more on providing more of the same sort of training facilities as currently exist. The trouble with this approach is that not all the companies within the industry invest proportionately the same amount in training, and there is already enough movement of people (people who are trained by one company and then recruited as 'trained staff' by others) to suggest that if some companies spent more on training, this increased investment might not produce *for them* a compensating number of trained people.

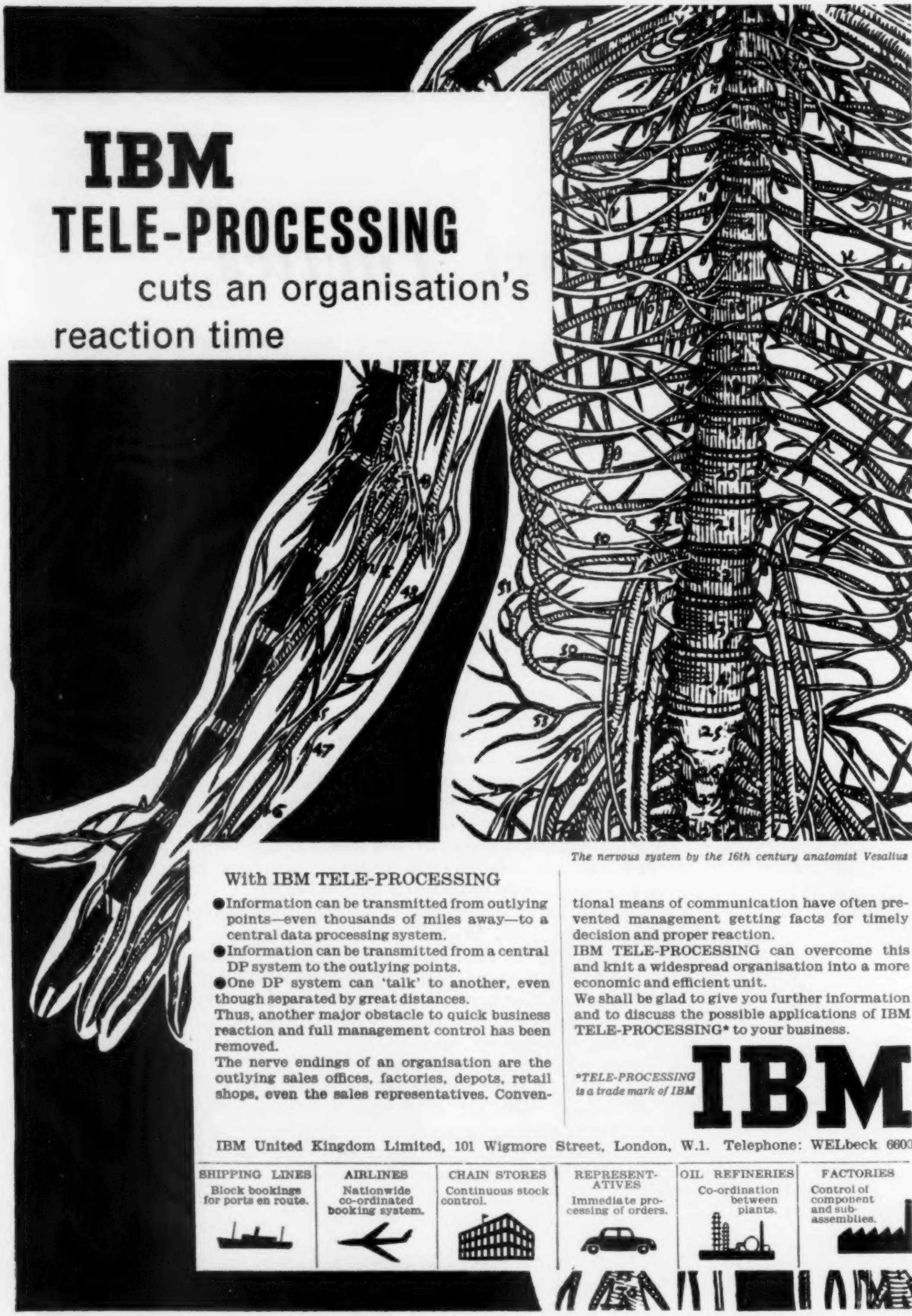
It seems that if the industry as a whole could encourage the existing educational institutions to offer much more training in computer technology and techniques (so that, on one level for example, vocational courses could be provided for young people just out of school), it would stand to gain immeasurably during the next 15 years. To do this successfully needs a supra-company body to decide what training to promote to meet today's and tomorrow's needs, and—most important—to go, hat in hand, to the manufacturers to ask for substantial funds.

If people are to be adequately trained to work with and use computers, then the universities and, in particular, the technical training colleges, must have computer installations. A very small number of technical colleges do have machines, but possibly one college in 10 will need to have them if the needs for *highly skilled* people are to be met.

This need not mean great expense for the educational institutions concerned if manufacturers have the foresight to see that it will pay them to be generous now.

For instance, a number of computer users are trading in early machines for new generation computers, and these redundant machines could well be offered to technical colleges at bargain prices.

It is up to the manufacturers to get the ball moving.


IBM
TELE-PROCESSING
cuts an organisation's reaction time
The nervous system by the 16th century anatomist Vesalius
With IBM TELE-PROCESSING
●Information can be transmitted from outlying points—even thousands of miles away—to a central data processing system.
●Information can be transmitted from a central DP system to the outlying points.
●One DP system can 'talk' to another, even though separated by great distances.
Thus, another major obstacle to quick business reaction and full management control has been removed.
The nerve endings of an organisation are the outlying sales offices, factories, depots, retail shops, even the sales representatives. Conventional means of communication have often prevented management getting facts for timely decision and proper reaction.
IBM TELE-PROCESSING can overcome this and knit a widespread organisation into a more economic and efficient unit.
We shall be glad to give you further information and to discuss the possible applications of IBM TELE-PROCESSING* to your business.
*TELE-PROCESSING is a trade mark of IBM
IBM
IBM United Kingdom Limited, 101 Wigmore Street, London, W.1. Telephone: WELbeck 6600
SHIPPING LINES
Block bookings for ports en route.
AIRLINES
Nationwide co-ordinated booking system.
CHAIN STORES
Continuous stock control.
REPRESENTATIVES
Immediate processing of orders.
OIL REFINERIES
Co-ordination between plants.
FACTORIES
Control of component and sub-assemblies.
CRC 84

News of the month at a glance

Honeywell offer computers

A subsidiary of the American Minneapolis-Honeywell Regulator Co, Honeywell Controls Ltd are to market in Britain two computers designed by the parent company.

The two computers in question are the American-designed Honeywells 800 and 400. The Honeywell 800 is a medium-to-large general purpose computer, with an average speed of 40,000 three-address operations per second. Capable of performing up to *eight* independent computing operations concurrently, the system is of modular design to allow for expansion, features error detecting and correcting devices for which Honeywell have coined the expression 'orthotronic control', and costs—an average system, that is—£395,000 (alternatively it may be rented at £8,500 a month).

In the USA versions of the 800 machine have been sold to the Massachusetts Institute of Technology who will use it for scientific work, and, by contrast, to an insurance company.

In a sense the Honeywell 400 is half an 800. Less powerful than the 800 it is still a magnetic tape system, aimed at providing companies with sophisticated punched card equipment with a computer alternative that is no more costly than the card system. The 400 comprises a central processor, independent console, four tape units, a 900-line a minute printer and a card reader capable of reading 650 cards a minute. It costs £139,000 (or it can be rented for £3,090 a month).

Compatibility between the 400 and 800 systems—both machines use the same tape units and ancillary equipment, and programs written for 400 can be run on the 800—means that a growing company could change from a 400 system to the larger system with a minimum of 'change-over' costs.

Within a year Honeywell Control intend to establish a service bureau in London around an 800 system.

Minneapolis - Honeywell have seconded Mr Charles J Coulter to direct the British subsidiary's new data processing arm.

More time to sell

—when the computer arrives

Through a chain of 150 stores in Scotland, England and Northern Ireland, the Clydeside Supply Co Ltd, retailers of television sets and furniture, hold some 10,000 different lines and have 300,000 hire-purchase and rental accounts. The company have ordered an Emidec 1100 computer, plan to instal it in Glasgow and to centralise all clerical activities around it. Thus the machine will be used to control stock levels, as well as keeping up to date all 'easy payment' accounts. In addition the computer will be used to produce a weekly payroll for 3,000 employees.

Clydeside Supply have already planned to introduce a measure of integration in their data processing. Cash registers in every branch will issue receipts to customers for all payments, at the same time recording each payment on paper tape. At the end of each day every branch will mail its punched tapes to Glasgow.

Thus details of transactions in all the chain's branches—having been recorded on paper tape—will be able to be fed straight into the computer within a day: this will enable the company to bring up to date buying, stock and sales records on a daily basis.

Details of goods sold by branches will automatically be given to buyers for use when replenishing branch stocks. In fact there may be no need for branches to submit requisitions eventually. Salesmen's commissions will be calculated daily and automatically added to weekly wage entitlements.

Clydeside Supply expect a number of benefits to result from their computer systems: *eg*. less clerical work at the branches will give salesmen more time to *sell*; information on sales trends will bring about a reduction in capital tied up in stocks.

Counting the takings

Machine now required

Since last December Littlewoods Pools have been using an automatic postal order counter-sorter to sort more swiftly the cash received in the form of postal orders from thousands of pool punters.

At present Littlewoods have only a ' pilot installation ' of this sorter, which has been developed by ICT's special products branch in association with GPO engineers.

To enable postal orders to be sorted mechanically the GPO now code all orders with three horizontal lines pre-printed at the bottom edge of each order—the relative position of these lines signifying cash value.

This has enabled ICT to develop a counter-sorter which can ' read ' (through photo-electric cells) the line code, and hence instruct how a postal order should be sorted. Photocell reading heads are also incorporated to determine whether an order carries stamps.

In the Littlewoods machine postal orders are passed to the sensing unit at the rate of 450 a minute and directed toward 16 receivers or boxes—twelve of these are coupled in pairs. Orders are automatically counted separately for each receiving pocket, and when a receiving pocket has 400 orders, the flow is diverted to the adjoining pocket of the pair so that no time is lost when a batch of orders is removed.

To sort a random mail bag of orders requires several runs on the machine—the equipment being reset for each run.

Whether Littlewoods will do all their postal order sorting on such a machine—the pilot installation handles only a proportion of the total weekly intake—is still not clear.

Push a button

. . . for stock figures

Builders Copper Tube Co Ltd, a member of the Metropole Industries Group, are a distributing company supplying a range of copper tubes and fittings to the building industry—at their warehouse at St Pancras, London, they stock some 5,000 items.

At their head office in Tottenham Court Road, Builders are to instal a Sirius computer which will be used for stock control, invoicing, and sales and cost analyses.

As sales mostly take place at the warehouse, there will be a teleprinter link between head office and warehouse: in this way stock movements will be quickly communicated to the computer.

It is planned to have the machine work out invoices and to produce invoice data on punched paper tape. The paper tapes will then be fed into the teleprinter transmitter, and at the warehouse end conventional invoice forms and advice notes will be printed out.

The computer is also to be used to produce re-ordering instructions: the current stock level for each item will be compared with a predetermined minimum required level held on punched paper tape. Stock deficiencies will be noted—by producing a ' deficiency paper tape ' which will be printed out in clear at the warehouse.

To help deal with particular enquiries, it will be possible to interrogate the machine to find the current stock level for any item. The information required will in this instance be displayed by numerical indicators, at the push of a button.

Builders' new invoicing and stock control system will cost under £30,000.

ADP and the law

Can you arrest a computer?

In the USA interest is being generated in the legal aspects of automatic data processing. A number of American lawyers have pinpointed problems—admittedly theoretical problems—that could arise as a consequence of introducing computers. For example, could punched cards or magnetic tape records be offered as evidence? Or where a computer makes decisions is a company liable for its errors? Again, where time is hired on a computer, to what extent could a centre be made liable for a major error in calculations producing very serious consequences?

No one has clear answers to hypothetical problems of this kind —yet. However, apart from the computer as a potent source of tort action, automatic data processing may also provide new openings for fraud. *Business Week* reported one large American bank's unhappy experience that has resulted directly from introducing magnetic ink character recognition: ' one of the bank's customers distributed his stack of imprinted slips (imprinted with *his* account number) among the writing desks on the banking floor. Other customers innocently used these slips to make their deposits, and all the money was credited to the conniver's account. He then withdrew his entire balance and disappeared.'

Games on Edsac

Part of a course

Collaborating with the university's Faculty of Economics, the University Mathematical Laboratory in Cambridge has developed a top management game for which

a computer is used. The game—known as the Edsac business game—bears a family resemblance to the original American Management Association game and to subsequent games developed at the University of California (Los Angeles). The companies are all engaged in the manufacture and sale of the same durable commodity and are called on to make period-by-period decisions about the production order, selling price, expenditure on marketing and market research, expenditure on research and development, and investment in new productive capacity. The computer is programmed to represent the economy in which the companies operate and the decisions made by the companies are fed into it. The computer then prints for each company a profit and loss account, together with other statistical and financial information. Each period the companies receive information about the selling prices of their competitors and also if they have paid for market research, information about their competitors' sales. At the end of every four periods (representing a year) companies also receive information about the assets of their competitors.

The game has been tried out several times with teams composed of senior members of the university and students. It is about to be used in connection with a course on industrial management conducted by the university's Engineering Department. The game may also be made available to people from industry and business.

An article describing at length a business game appeared in the April issue of AUTOMATIC DATA PROCESSING.

More revenue

SAS check their weight

What can be described as an 'aircraft payload control system' has begun operating for Scandinavian Airlines at Kastrup airport, Copenhagen.

KEYSETS RECORD LUGGAGE WEIGHTS

. . . and the computer tots up the payloads

The reason for introducing this elaborate system—it comprises a computer and other equipment devised by Standard Telephone and Cables Ltd and their associates Standard Elektrik Lorenz of Stuttgart—is that airlines have to know what weight of baggage each passenger has. With the number of passengers and their combined baggage weights determined before each flight, the airline knows the total payload and how it will be distributed, and if their information is available in good time spare capacity can be used to carry freight or mail and thus much more revenue can be earned.

For this information to be available in good time the new system which cost £100,000 has been installed. It employed a computer which collects checking-in data from all airport counters and totals these to provide the information required for compiling aircraft load sheets.

Information is relayed to the computer via a number of special keysets (similar in appearance to those used in SAS's electronic seat availability system—see the February issue of AUTOMATIC DATA PROCESSING).

American Developments

Breaking One Bottleneck

Carl Heyel writes: 'Hard of hearing and tongue-tied' could well be a tag-line describing even the most 'sophisticated' modern computers, despite their fantastic speeds and versatilities. The tremendous capabilities of computers have always been hampered by the slow (by comparison) input-output devices—read-in from cards or tape, print-outs, and human intervention between those devices. So it is headline news when a component-unit manufacturer brings out a development which will help break the bottleneck.

On the input from magnetic tape, and transfers from tape to tape, a recent preview-demonstration by Potter Instrument Co and Bendix Corporation of Potter's new high-density recording system for digital computers is a significant development for the 'new generation' of computers—especially for business use, where the volume of information to be handled in large-scale installations is enormous. For the first time, information can be transferred from magnetic tape to the core memory of a high-speed computer *at computer speeds*. This makes it possible to by-pass buffer units, provides much greater flexibility of programming, and will permit many of the new generation of computers to operate closer to, or at, their true speed capabilities.

Bendix, which kept in close

touch with the development work by Potter's Dr Andrew Gabor, is the first manufacturer to incorporate the new system into its hardware (Potter currently supplies its conventional tape handlers for use in computer systems of Autonetics, General Electric, Philco, RCA, Stromberg Carlson, and others, and the new system will not be restricted to any one manufacturer). The Bendix G-20 Data Processing System, announced last March, will employ high-density recording in its magnetic tape system, to be known as MT-10, incorporating a version of Potter's 90611 Tape Handler.

Economics of High Density

An insight into the economics of stepping up the efficiency of magnetic tape memory is given by the following rough comparisons of the cost of equipment involved (where cost is traded for speed and ease of access): approximately $1.00 per bit of information for the super-high-speed magnetic cores (used in high-speed internal memories): 10 cents per bit in magnetic drums (used in slower internal memories, and for some random-access equipment); a few mills per bit on magnetic tape; and, with the new high-density recording, in the range of appreciably less than a mill per bit on tape.

The high speeds of the new recording system are, of course, due to the dense packing of information—crowding on a reel of 1-inch tape approximately 11 times the amount of digital data recorded in the most widely used conventional computer systems.

Limitations on dense packing have hitherto been due to difficulties in obtaining sufficiently precise alignment so that information recorded simultaneously is read back simultaneously. Characters are represented by the existence or absence of magnetic dots which are lined up in rows perpendicular to the travel of the tape. It can be seen that even the slightest skew under the reading head would create trouble, causing a bit that was originally lined up correctly with its neighbor to be read earlier or later. The Potter system is ' self-clocking ' in that each bit is separately marked with a timing bit, and is properly kept track of in a small ' de-skewing buffer ' even if it does come under the reading head a trifle early or late.

Here is an idea of the orders of magnitudes involved: with 1-inch tape, conventional systems provide for 300–400 characters or bits per inch—beyond that, ' tilting ' problems would be encountered. (By special electronic compensation, IBM achieves 556 per in.) The Potter high density system permits a range of 1,000–2,000 bits per inch, although in the current G-20 design, a conservative 1,100 per inch packing density is employed.

Obviously, reliability is a big factor in any user's mind. Potter advise that despite transfer rates as high as 360,000 alpha-numeric characters per second, via 16 parallel recording channels on 1-inch tape and at packing densities up to 1,500 bits per inch higher reliability is achieved than is expected of standard recording methods. In a recent test of 40 hours of continuous operation, less than two seconds of re-read time were required to recover data lost through transient error. During this test, no permanent loss of information occurred.

Counting Citizens Today

Just about now the first results from the 1961 census of population—the preliminary reports of the numbers of males and females in counties and towns of over 50,000—will be coming off the Army Pay Corps computer at Worthy Down.* As soon as the first stage of documentation, the comparison of population figures in 1961 with those in 1951 and 1931, is completed, the computer will be put to work examining in detail the household schedules, which every ' head of household ' completed on 23 April, 1961.

For most people the beginning and end of the census operation was the completion of their household schedule. For the planners of the census, however, this was merely the culmination of two and a half years of preparation, work that began in fact as soon as the last census, that of 1951, was finally completed.

First, this entailed deciding on a method for producing the various statistics required. The 1951 census reports were produced, via punched cards, on tabulators; but for the 1961 census it was felt that a faster method was required, since a number of additional facts had to be computed. Fortunately, there was a computer with a large memory store and fast calculating capacity likely to be available, an IBM 705, which had been ordered for the Army Pay Corps in the same year, but which was then still at the drawing board stage. It was decided that the census would be processed on this machine.

The next point to be worked out was the number and scope of the questions to be asked, the areas into which the survey would have to be broken down and the unit of surveillance. This unit, known as the enumeration district, was calculated on the basis of 250 schedules, or an estimated 650 to 700 persons per district. Also determined at this stage was the number and type of statistical records which it was required that the census should yield. A separate program had to be

* For a description of this installation see AUTOMATIC DATA PROCESSING April 1961, page 6

written for every one of those records, so that, in all, more than 200 computer programs had to be prepared before the compilation would be processed on the 705.

As the time for the census approached a census centre was set up in Titchfield, some 17 miles from the computer, which was located at Worthy Down, just outside Winchester.

The census centre was the ' post office ' for the census schedules, where they were received from the enumeration districts, coded, and converted to punched cards for handling by the computer. It was also the unit for error correction.

On census day plus one the enumerators called on householders, collected the completed forms, at the same time entering in ' collection books ' the number of males and females per household and the number of rooms occupied. These books later served as a check. Also at this stage each enumerator marked on special cards the number of males and females in every household, etc. These marked cards were sent direct to the Titchfield centre, and the schedules and books went to the local area office. Then, after checking, the schedules and estimators' books were sent to Titchfield.

At Titchfield all the marked cards were passed through a mark sensing punch and converted to punched cards. These cards were batched and sent to Worthy Down, where they were reproduced and sorted by area. The cards were then read into the 705, by means of a special program which automatically compares the figures from the cards with the comparable figures from the schedules of 1951 and 1931. The output of this operation was in the form of 80-column cards, which were converted on an IBM Cardotype typewriter into justified typescript.

As we go to press these typescripts are being photographed, and from the negatives the copies of the preliminary records will be produced, containing the breakdown of the number of persons in towns of more than 50,000 as compared with the numbers for 1951 and 1931.

As soon as these preliminary records are prepared, the second and major operation of census preparation can begin. The schedules for every area, divided into enumeration districts, and accompanied by the enumerator's book will be received at the census centre. The first operation will be to separate the schedules into three main streams of punching. These are the household schedules for 90 percent of the population; the household schedules for the 10 percent who had the larger form to complete, with details of scientific education, etc; and the schedules for the special enumeration districts, for hospitals, military camps and institutions with a population of more than a hundred persons. When this is done, the non-numerical information on the cards (where born, etc), will be coded, and then the schedules will be passed to the card punching department for the information to be punched on to 80-column cards. For this purpose the Titchfield centre is equipped with a 100 card punches and verifiers.

The cards after being verified will be sent to the computer centre at Worthy Down, where the information they contain will be transferred to magnetic tape.

Magnetic tapes will first be edited by a ' consistency run '. A special consistency program checks not only the accuracy of the figures, but also the verisimilitude of the statements made. The computer is programmed to query not only near impossibilities —such as a child of three being listed as married, or a person married two years having ten children but also such likelihoods as persons being 95 years or over. From this scrutiny the schedules passing the test are to be written on an edited magnetic tape, and those queried on a semi-edited tape. A list of queried items is produced on the output printer and this goes back to Titchfield, where records are compared and correction cards punched.

The editing run is then to be carried through in its entirety with the semi-edited tape and the cards—in case there should be new errors arising from the corrections. When all the error correction procedures have been completed, a final ' clean ' tape will be created from the partly edited and edited tapes from the various correction stages, and this run will utilise a sorting program to bring the information back into area and enumerator district sequence.

The tape will then be ready to be broken down into the relevant information for preparing statistics, according to a number of special programs.

The final results will be punched out into 80-column cards. These will be passed to the Cardotype department, where they will be printed out three times, using three Cardotype machines. In this way the results will be printed out in three type styles—normal Roman face, bold and italic. The make-up people will then be able to cut up and paste the various sections of the results in different type styles, and this dummy will be photographed so that plates can be made and the results printed.

It is reckoned that the final tables of statistics (with such novel details as the contrast between the number of people resident in one area and working in another, etc), will fill four feet of shelving, and should assist many government departments and market research organisations, in respect of housing, population, technical education and many other particulars.

In spite of the enlarged scope of the 1961 Census, it is reckoned that by using the computer, the final statistics will be prepared in three years—just about half the time taken to get out the results of the 1951 census.

Honeywell Data Processing

for Industry and Research

Logging equipment, incorporating 'Pinboard Programming' at R.A.E. Farnborough

At the Royal Aircraft Establishment, Farnborough, a Honeywell three-bay data processing system with electric typewriter print-out is now logging:

- 139 temperature inputs in 3 ranges
  0 to 99·9°C, 0 to 650°C, –50 to 300°C
- 96 pressure inputs in 4 ranges
  0 to 20 p.s.i., 0 to 50 p.s.i., 0 to 200 p.s.i., 0 to 500 p.s.i.
- 4 speed measurements
- 1 reference point

The equipment is based on the Honeywell Digital Potentiometer principle. It makes extensive use of mercury wetted relays and incorporates a unique feature—Pinboard Programming. Drawer-mounted pinboards add an easy flexibility to adjustments of span, zero suppression and alarm limit settings. Only a simple repositioning of pins is required to change these functions. Speed of operation, simple maintenance and continuous checks are other built-in advantages of this Honeywell system. It is suitable for research, industrial development and may also be used to supply information to computers. Annunciator panels, linearisation circuits and other features are available.

WRITE OR SEND THE COUPON TODAY to
Honeywell Controls Limited, Greenford, Middlesex. Waxlow 2333.

I am interested in Honeywell data processing (logging/scanning) equipment

for ____________________

____

Please send me Specification Sheets SS 306-1, SS 312-1

Name ____________________

Position ____________________

Company ____________________

Address ____________________

____________________ ADP

Sales Offices in the principal towns and cities in the United Kingdom and throughout the world.

Honeywell

First in Control

H HONEYWELL SINCE 1885

From the Conference Room

No Bristles on Gillette

W Brackman

Brackman: 'We learnt something more about our business information problems'

THROUGH a complex of companies Gillette products are sold throughout the world (with the exception of certain iron curtain countries), and the parent company of this group is the Gillette Company of Boston, Mass, USA.

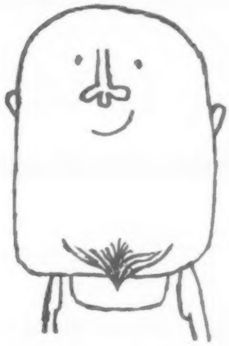
The entire American market is supplied from a single factory in Boston operated by the American division, the Gillette Safety Razor Company, which manufactures all that market's requirements of razors, razor blades and shaving cream.

During the period from 1955 to 1958 the company went through the various stages of considering computer data processing, selecting, preparing for and installing a computer, and getting it to produce results.

At the time we became interested in computers in Boston our annual sales volume was somewhere between £15 and £30 million a year. We sold to about 6–8,000 wholesale customers throughout the entire country and we shipped to about 8–10,000 different shipping points. Each day we received between 600 and 1,000 orders from our customers during normal times and twice this much during peak periods. Even though we sold only razors, razor blades and shaving cream we sold them in so many different styles of packing and quantities of packing that our product list totalled approximately 300 items in all. One of our biggest problems was to handle the large and varying volume of sales paper work entailed, and also assist our overloaded and overworked shipping department to

How the biggest producer of razors in the USA looked into computers, installed one and then outgrew it

– this is the story that William F Brackman related to business conferences held in February and May and which we publish below. Mr Brackman is an American seconded to Gillette Industries Ltd of Middlesex where he is deputy financial controller. Previously, he was controller of the parent Gillette Company of Boston, Massachusetts, and was responsible for their early entry into the computer field.



handle the problem of shipping the goods we sold from a single warehouse in Boston. Although you might suspect that the razor blade and razor business was steady and uniform rather than subject to seasonal variations, however, we deliberately set about making our business somewhat seasonal by reason of advertising and selling heavily at certain times of the year. These were Father's Day in the early summer, the World Series Baseball Game Championship Play-Off, and of course, Christmas. Our business was growing and it was our job to find some way to take the strain and pressure off our sales accounting paper work problem and assist the shipping department so they made few errors and met all dead-lines.

In the computer field back in late 1955 and early 1956, there were already very large scale and very expensive computers in successful operation for scientific and engineering purposes. Our own Federal Government was quite a computer user and a few large insurance companies had started to use big machines, such as the Remington Rand Univac and the IBM 700 series of computers, to process the tremendous mass of information about policy holders they handle. In addition, a small number of medium size computers had appeared on the market and were attracting quite a bit of attention. Most of all, however, the use or possible use of computers was attracting the attention of quite a number of companies about our size. The subject was well written up; computer conferences abounded. It was truly difficult for an alert and well informed American business man to be unaware of computers. Our organisation and methods department kept informed on the subject of computers and attended conferences and seminars on the subject. I was very much interested myself to quite a degree. In our own case we knew that we had one large data processing problem that we hoped would almost justify the computer equipment simply on the basis of replacing current conventional punched card equipment and replacing certain clerical staff. We felt that, if it could show a break-even cost at this stage, we would be justified in acquiring such equipment since the one job would not use all its capacity and we could hope to earn a profit out of other work it would do for us.

CAUSE TO PAUSE

There was one strong reason, however, which argued against our going into computers at this time. Our company had developed an efficient organisation and methods department as well as a competent punched card department. We were very much aware that we still had considerable unfinished systems and procedures work ahead of us and considerable advantage to gain merely by continuing to develop and improve systems without introducing computers.

At this stage, it was my responsibility to make a decision either for or against a computer. As a result, I did what was considered the popular thing

at that time. I formed what is called a Feasibility Study Committee. This was appointed from personnel within my own (the controller's) department and led by the head of the O and M department. I directed them to analyse our problem and review the computer equipment field and within 90 days to make a recommendation as to whether or not we should go further with this equipment or stay out of the computer field for at least two years and meanwhile concentrate on ordinary systems improvements without the benefit of computer equipment.

I will admit straight off that the committee took six months instead of 90 days, but this—we later discovered—was in itself a remarkable accomplishment. They first analysed and developed statistics on our own problem so that we could present them to computer manufactruers. Then we went to visit certain computer manufacturers at their own plant to see their own equipment and their own staff. We also invited them to send technical representatives to our company to study our problem and submit a proposal to us showing how they could successfully instal one of their machines or systems and how it would be used to do our work. *We also asked them if they could direct us to a*

GILLETTE IN BRITAIN

In Isleworth, Middlesex, the British company, Gillette Industries Ltd, operate the second largest manufacturing unit of the Gillette group, where—as in Boston—razors, blades, and shaving cream are produced. This organisation, with an area of 300,000 square feet of factory space at Isleworth and with subsidiary factories in Reading and Farnborough, supply not only the entire British market but also some 150 overseas territories—in Europe, Asia, Africa, and the Dominions. This means that, although the quantity of goods despatched from Isleworth may not match Boston's output, the number of price variations and product packaging is very much greater. At least a 1,000 different packagings of the various products have to be offered.

To produce sales and accounting statistics and to perform certain other routines such as invoicing Gillette installed their current combined IBM 604 and 421 punched card control system in 1959. By the end of that year, however, it became clear that this system, even if doubled up, could not meet the needs of Gillette's expanding business, nor could it provide the integrated system Gillette sought. An altogether deeper concept of documentation was required, based on a computer. After an earlier flirtation with an IBM 628 calculator, Gillette placed a firm order with IBM for the then wholly new 1401 computer. This is due to be delivered this November.

Preparing for the computer began in January 1960. The O and M department was given four jobs to tee up for the 1401: (1) the handling of home sale orders, and (2) overseas orders; (3) production recording, (4) costing and general statistical work.

These computer jobs will of course be inter-related. Processing an order so that finished goods are despatched to a customer from the finished goods warehouse will only be the start of a chain of events which will comprise preparing daily statistics, the daily comparison of sales forecasts with actual sales and bringing current production into line.

Gillette receive about 250 orders daily from the home market, either direct from wholesalers or from special customers; alternatively they may be orders taken by sales representatives. Most orders are from established customers, many of them routine stock replacements. After being passed by credit sanction they come to the data processing section for action.

Under the projected 1401 system, the amounts and categories required will be punched on to an 80-column commodity card; these cards will then be merged with the fixed information regarding the customer: his full name, address, constant delivery details, etc, held on pre-punched cards.

These cards will be passed to the computer and processed. The computer will be programmed to produce multi-copy invoices; at the same time a summary card will be punched to record the total invoice amount and to provide a sales ledger. From the commodity cards the 1401 will subsequently produce sales statistics: sales by product. main outlet, territory district and area, and by wholesale and special accounts.

A second computer run will compare these daily sales figures with sales forecasts. From this comparison a schedule of amendments to the sales forecast can be produced, which will be passed to the production record office. Since production forecasts are based on monthly sales forecasts this adjustment schedule will allow machine production to be stepped up or jacked down as circumstances require.

Overseas orders are to some extent handled in a similar manner to home orders. About 30 overseas orders are received daily from agents or shipping houses; some of these will be automatic replacements of stock. The bulk of the different varieties of packings are for overseas territories, but each territory's choice of packing is pretty well pre-determined. The complications of overseas shipping, and the small quantity of daily orders received make it more practicable to do the invoicing operation as a manual operation instead of on the computer. But the overseas sales statistics will be prepared on the computer, as well as many of the

satisfied customer who was using one of their machines or systems. In addition, we requested very substantial assistance for programming our work before taking delivery of a system.

CHOOSING THE RIGHT FIT

In our search we found young inexperienced computer manufacturers with good equipment which was not yet tried out in commercial use, we found others with good equipment but no installation staff, and we found incompletely designed equipment that was being heavily advertised as if it were already tested and proven.

actual stock replacement calculations.

The production recording system is still at the planning stage. The basic requirements of the system are reports of items produced, broken down by department operation and machine, which can be compared with the production forecast, from which surplus or deficiency reports can be prepared. As an ancillary operation, the computer will analyse the raw material stock position at each stage or operation of the production cycle. Analysing machine utilisation in terms of breakdown, scrap, and man-hours will comprise another ancillary run, valuable for determining whether, for example, a new machine tool is required.

For the labour department it is known that the computer will be able to produce the payroll for Gillette's 2,500 employees at the Isleworth works. In addition this information, combined with the knowledge of the time spent per man per job, will assist in producing labour costing records; and with the further merging of these figures with the cost for production a great deal of the preparation of the standard costs report will have been completed.

Gillette do not expect their computer to be fully utilised until the middle of 1962, when they anticipate that it will be handling work not only for the main Isleworth factory, but also will be undertaking work for the Gillette factory at Reading.

Very simply stated, the only differences between the small and large computer systems are those of speed of working and capacity for storing information, and since cost increases with size it is very important you should choose a system which fits the size of your problem.

At Gillette we had a relatively small problem and so we chose a relatively small computer, the IBM 650. Why did we choose the 650? First, it was the only one of two reliable machines on the market at the time which could theoretically do our job and still be in our price class. Second, IBM had satisfied us on all the points commented upon above (theoretically, the machine could do the job; assistance in programming; a satisfied user, etc). The closest competitor could not provide programming assistance and was unable to make a detailed proposal to us proving the equipment could do the job without a doubt. And so we placed an order for an IBM 650 and simultaneously made our first big error.

We asked for and received accelerated delivery; we got our machine in nine instead of the usual 18 months. This meant that we had to work on a very tight schedule under constant pressure in order to be ready for the computer when it arrived.

A computer generally means changes in the ways things get done, and there is generally a real advantage in either getting it in at the beginning of your new financial year or perhaps at some exact halfway mark. In the light of experience I would suggest it pays to give yourself plenty of time in establishing a dead-line; and don't try to be a big hero and show how much punishment you can take. It also makes a great deal of sense to give the job of planning, ordering, installation and scheduling of operations for computer equipment to *one person* only. It is unwise, at the start, to have a computer do two different jobs for two different departments, if timing is at all important. If the computer is primarily for commercial as distinct from, say, engineering use, give the machine to the controller and make him responsible for scheduling the running of it. By making it the responsibility of the managing director's office, a committee or the engineering department you greatly weaken the chances for a successful *commercial* application.

THOSE THAT RESIGNED

We had calculated that the computer would replace a certain number of clerical personnel, and since it was the policy of the company not to lay off people unless absolutely necessary in a major economic crisis, we made certain studies of the number of personnel who resigned in any given year and the reasons for such resignations. We found that in the 18 months prior to ordering the computer, 21 of our female clerical personnel had left us to go home and start a family, and we calculated that if this

continued even at a somewhat reduced rate that it would be sufficient to take care of the anticipated reduction in staff. As a result, we held a meeting with our supervisory personnel to announce the ordering of the equipment and the reasons for it and the anticipated reduction staff and also reassuring the personnel that the normal rate of leaving for pregnancy and other reasons was sufficient to take care of the problem and no one would be dismissed. I am completely at a loss to account for it, but for one year from the day I made the announcement not one woman left on maternity leave. That taught us a great deal about using the statistical approach to a problem, especially when a woman is concerned.

WHAT WAS ACCOMPLISHED

At the outset of this venture, we felt that if we could prove to ourselves that a computer would, on a cost basis, enable us to break even by taking over the handling of one single large mass data problem, it would be justified. As a result, we calculated that a certain amount of clerical personnel in our ' customer accounting groups ' would be surplus and a certain quantity of our conventional IBM punched card equipment would also be surplus and that the combined cost of these two factors would equal the rental cost of the IBM 650 equipment. We did not add into that cost the cost of programming the equipment nor the continuing programming that would be required after installation, since we count these programs once written as a permanent investment and not an expense factor. We originally anticipated that the large programming staff created to accomplish the first job would gradually diminish until only a small number were kept on hand to revise and keep up to date the original programs.

We made these plans and estimates in the first quarter of 1956. We ordered the equipment in the third quarter of 1956. We received it in the second quarter of 1957 (May, 1957). After it was in use for approximately one year, we made an analysis of our accomplishments. This was in the fourth quarter of 1958.

As a result approximately two years had gone by in the interval. This is what we discovered:

1—the 650 was doing everything that we had planned for it with the resultant reduction in personnel in the clerical departments.

2—approximately the same number of personnel were employed in the controller's department in total.

3—not one piece of IBM conventional equipment had been released as a result of the computer.

4—that the programming force had not reduced in quantity as a result of having finished up their job and going back to their original assignments.

Yet, in spite of this, we were still breaking even on a cost basis with the computer. We had eliminated clerical functions and jobs and the need for conventional card equipment and operators to do those jobs. What had happened to us was that the company was growing with greater than average progress in a period of considerable prosperity with the result that there was growth and expansion of clerical personnel and need for information which resulted in our needing very badly the IBM equipment that we had retained and also needing the clerical personnel which otherwise would have been redundant. The computer did not reduce our overall departmental expenses, but we were able to take on more work and responsibility without increased expense. It was not a miraculous dollar saver by reason of doing tasks better than clerks or slower equipment. But it did three to 10 jobs at once and with tremendous speed and accuracy.

I would say instead that it began to teach us something more about our business information problems.

ONE BIG PROBLEM

What of the work the computer actually did?

In the past we had for the most part considered that we had about a dozen or more different problems which were created whenever a customer placed an order with us: writing down the order and communicating its contents to the people it concerned; invoicing, and communicating details to the shipping departments; checking on a customer's credit status; noting that stock was now reduced and would need to be replaced; creating a sales statistic, and so on. We had attempted to solve each problem as a separate one and sometimes independent of the others. Now with the computer we changed our viewpoint toward the customer's order and began to look at it as if it were one big single problem rather than a lot of small ones. We were able to do this simply by tracing the path of the customer's order throughout the organisation and attempting to have the computer do what people had done before. For example, we first taught the computer to recognise the difference between one customer's order and another simply because 90 percent of our orders were handled in one way and 10 percent in an entirely different way. The computer never failed to recognise the exception and handle it exactly as it should. We also found that since the computer could accomplish

continued on page 40

Fur brokers Hudson's Bay Co Ltd use a computer service bureau to inform 1,000 South African fur farmers what their furs fetched at the London Persian lamb auctions

David Roach Pierson

Fur Under the Hammer

TAKE a fur auction, to which over a thousand farmers in South and South West Africa have sent some 500,000 Persian lamb furs. Allow that there are some 80 grades and qualities of fur into which the skins must be divided; that each farmer probably offers furs in many different grades, and in consequence in many different auction lots. And then reckon that you must be able to reconcile all these different furs in different lots back under the farmers so that you can notify each farmer a few hours after the auction what prices his skins have fetched, and follow that ' news flash ' with the detailed sales document (comprising details not only of sales per grade, but also all overhead charges for shipping, local taxation, etc) within 24 hours. That was the problem that Hudson's Bay Co Ltd, the biggest British fur brokers, presented to a Leo service bureau, when they asked them to undertake the sales accounting for their bi-monthly Persian lamb auctions.

Hudson's Bay had already gone some way towards mechanisation within their own organisation. This is hardly surprising, since they are handling annually some £8–9 million worth of furs, of some 70 different kinds: afghan lamb, mink, beaver, etc, from almost every fur producing country around the globe. A 21-column punched card must be prepared for every fur which comes in, on which the farmer's number and the grade are entered. A battery of five 21-column Powers Samas tabulators handle the accounting of the various auctions.

However, the Persian lamb auctions do present factors which make them suitable for computer handling, or, alternatively, unsuitable for punched card handling. The auctions are held six times a year, beginning with the first sale of the season in September, and carrying on through November, December, to February, May and July of the succeeding year. As there are only four points of origin—the three farmer's co-operatives in South West Africa and the Union

and one London shipping agency—the amount of source documentation is relatively concentrated; basically, the operation is initiated by the bills of lading sent by air in advance of the consignment. Also the quantities of furs, though very large—between a quarter and half a million skins—are sent by sea, and arrive at a pre-determined time, which enables the closing date for the auction to be fixed precisely. These factors enable the auction documentation to be carried out according to the fairly strict discipline that the computer imposes. The quantities are large enough to make computer operations feasible; and the documentation sufficiently streamlined to allow various factors (farmer, grade, area, price, etc) to be accommodated in the computer program.

Another factor in the auction accounting is time. An idea of the time scale can be gained from a glance at the September 1960 auction. In this, the first sale of the 1960–61 season, beginning on 6 September, 273,547 skins were submitted by the auction's closing date, 13 August. This was smaller than average, but due to a shipping strike and air freight complications arising from the Congo troubles, this meant no let-up for Hudson's Bay in London. In fact unpacking, checking, grading and lotting of this quarter of a million load of furs had to be carried out in 18 days.

The last skin was graded on Wednesday 31 August, 20 hours before the first show day. Five show-days are usually provided to allow buyers to inspect the ' show ' fur lots (the first 400 furs of each grade), and in the 20 hours between the end of the grading and the first show day, the draft catalogue is prepared. This catalogue is later substituted by a final catalogue, which has been vetted by computer.

The sale began on Tuesday, 6 September, and ended about midday. Bids are usually in terms of prices per skin, and the final value of a lot depends on the number of skins shown against each lot on the catalogue multiplied by the price bidded. As soon as the auction finished the prices were rushed to the computer bureau. The next day at 9 am, the accounts department received a statement known as the ' account sale ' note, for each of the farmers who had submitted skins for sale, with details of the price fetched for every skin in each lot, less commission, freight, insurance, etc. Then Hudson's Bay had merely to separate and despatch the statements to farmers in South or South West Africa.

How is this sort of rapid working achieved? Principally by doing as much as possible of the preparatory work on the computer *before* each sale takes place.

BACK TO THE FARM

The data processing operations start in effect from the moment the farmer brings in his skins from the farms to the Hudson's Bay co-operative in Windhoek, or any of the centres for the four main areas of Karakhul sheep-breeding.

When the skins are taken by the farmer to the co-operative, they are checked and listed on a despatch list; only the code number of each farmer and the number of skins are noted at this stage. This list is air mailed to Hudson's Bay, who prepare a 21-column card for each skin delivered by each farmer. On this card are listed simply the farmer's number and the gang number of the skin. A copy of this despatch note is sent by Hudson's Bay to the Leo service bureau.

The skins are then packed by the co-operative and sent by rail to the port of despatch whence they go by sea to London. A multi-copy packing note accompanies the consignment which is checked at the Hudson's Bay warehouse when goods are received. A copy of the packing note also goes to the computer bureau, from which they are able to compute the cost of transport, and other charges and deductions, such as local tax.

The skins are marked with the farmer's code number, so that the first job that the warehouse has to do is to reconcile the 21-column cards with the appropriate farmer's skins. When this has been done, the grading of the skins can begin. The skins are graded by colour, quality, and some 14 other variables, and batched together in grades. The grades are further sub-divided into lots, the 'show-lot' of 400 skins, which is shown to the buyers, and on which bids will be made at the auction; and the ' string lots ', the remainder of the skins up to 2,000 divided into lots of 400. When grading has been completed the cards are detached from the skins, attached together by an elastic band and sent upstairs to the tabulating room. Here they are totalled and a head card per grade with total skins per grade is punched. The grades are then accumulated until a unit batch of 100,000 cards is reached; then the cards are reproduced and tabulated.

The result of this tabulation is a printed list of all skins in each grade, and the total per farmer in every grade. After sorting the cards are then put into farmer order and number of skins per farmer in all grades, and the grand total of skins is accumulated. A copy of these tabulations goes to the Leo service bureau.

The unit batch of 100,000 21-column cards is then sent to another computer centre—the ICT centre in London—where the information on the 21-column cards is transferred to 80-column cards. These 80-column cards are pack punched with the grades per farmer, so that every farmer has one or two cards referring to all the skins which he has in every grade. Pack punching means that as many as 14 grades can be put on to one farmer card. When the 80-column cards are completed they are sent, with the appropriate

check total head cards, with the total of skins per farmer, etc, to the Leo service bureau.

So far the service bureau has received

—one copy of each despatch document (from the co-operatives)

—a copy of each packing document from the London warehouse

—a tabulation of skins by grade from Hudson's Bay's accounting department.

Totals of these documents and the tabulation must be checked and reconciled with the 'farmer cards' to ensure that every farmer has the correct number of skins in every grade; an error here could mean the difference of many pounds. This so-called 'computer reconciliation run' ensures that no skin has been lost or that no errors have occurred in the course of punching and re-punching cards.

After a brief setting-up run, a binary card is prepared by the computer after checking all the calculations and reconciling the information obtained from the various stages. This binary card is run on a one-for-one basis against the 80-column cards, and from this match an amended binary card is produced, giving the grade and number of skins for each farmer; a print-out of discrepancies in each grade for each farmer is also produced. This print-out goes back to Hudson's Bay, who check and make the necessary amendment slips. The amendment slips link up with the 'expected amendments' cards punched out as a by-product of this run. At this stage information regarding the expenses incurred is also fed in, and the computer program operates to divide all these several expenses, overseas commission, local commission, transport, haulage, and apportion them to each farmer; these sums are punched on to the binary card during the discrepancy run.

Also fed into the machine at this stage is the draft catalogue, the skins that each farmer has in each lot, identified by the skin number prepared at the initial gang punching. This information, fed in on punched tape, provides a further check on the grades and numbers of skins per grade that each farmer has. From this interrelated information, the computer prints out a catalogue break-down of the groupings of quality of skins by area, and other tabulations as required. This catalogue breakdown is a statistical analysis of skins in the 13 major grades by four geographical classifications and is used at the time of the auction, the prices being inserted in the spaces provided. In this way statistical calculations can begin almost before the last lot has been knocked down. Thus, full details of prices realised, sub-divided into the main grades and types of skins, are prepared for cabling to Africa the same afternoon. Full statistical comparison is provided by the provision of the average prices per skin for both South West Africa and the Union.

All these calculations are completed three days before the auction and the discrepancies can thus be checked on out at Hudson's Bay by manual checking and reconciliation. The amendments are sent back to the service bureau on amendment slips, which are converted by the service bureau's Creed 77 PN tape punches into punched paper tape.

EVERYTHING BUT . . .

The service bureau now has all the information except the actual prices which each lot has fetched. This can come to them only after the auction. The sales are usually over in one morning and a 'priced' catalogue is rushed to the bureau.

The completed catalogue contains the prices fetched for each lot, and the serial numbers of the buying firms under each lot. The information read into the computer for this final run is: first, the farmer's name and address from the magnetic tape store, the farmer's record on binary cards; the commission lists, for local and overseas commission on punched cards; then the reconciliation information and the expected amendment cards, and the amendment lists on paper tape.

From this the payments list will be printed out. First, however, a summary is printed out of the net proceeds of every farmer, and simultaneously a punched tape is prepared which can be put on a Telex transmitter and radioed the same day to the farmer's co-operatives. In this way the farmers can be informed the same day of the prices fetched by their skins. The payments sheets are now prepared on the printer. The name and address of the farmer is first entered, then the codes for stencil number, date of auction, etc. The computer printer then prints out the lot number, the grade, the price each skin fetched and the gross price. The print-out is over five fields or columns, to speed the printing. At the foot of the form is listed the total number of skins, the gross average price, the gross amount obtained, and the various deductions, local and overseas commission, transport costs, insurance haulage, export tax and the net price. The forms are sent as a continuous pack to Hudson's Bay, where they are separated and sent to the co-operatives by air-mail within two days of the end of the auction.

'As we begin to understand the computer business' says Mr P L Davies, office manager of Hudson's Bay, 'and they (the bureau) begin to understand ours, we are finding that within the basic discipline the computer imposes, there is considerably more versatility and flexibility than we believed possible. They have been able to suggest modifications in the computer program to help us, and thanks to them the currency transition from pounds to rands in South Africa has caused us no headaches.'

Information Goes on the Screen

A display projector by Ramo-Wooldridge onto which information generated by a computer is screened.

AN important field of data processing technology has been developing with little fanfare and public press. During the last eight years, a number of techniques and devices have matured for the presentation of digital information as display. The keywords here are ' information pictures '.*

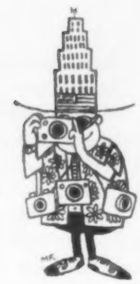
The radar ' scope ' that provides a picture on a cathode ray tube of what the radar ' sees ' is familiar to most people. This concept is easy to grasp, although not easy to explain, since it is directly analogous to human vision. In the data display situation, the cathode ray tube tells what the system ' knows ', by translating requested information into printed characters that can be read. This can be carried one step further; instead of asking for a printed message, we might ask for a picture to be displayed, drawn by the computer from the digital information available to it.

One reason that the development of digital display devices has not met the public eye is that they have primarily been used in military operations, secondarily in engineering work. Only recently has their possible applicability to commercial information systems been explored. This subject is being approached—justifiably—very cautiously. However, there are indications that there may be an extremely interesting future for these devices in management information systems.

There are three classes of situation in which the ability to display data can be important. The first

* These are produced by multiple random character generating systems using cathode ray tubes or large screen projection.

AMERICAN REPORT



from John Diebold and Associates, New York

Developments in data display devices open up opportunities for 'monitoring' business situations

is that in which we want the answer to the question 'How are we doing?'—in other words, what at the moment is the status of a given process or variable. This might be called real-time monitoring, and there is probably no need for a printed record. The second situation is that in which we want certain information quickly from a store of information but our need is transitory. We might not really know exactly what information it is we want, but want to examine a number of bits of information in order to isolate the useful information. This might be called information search and retrieval.

In both the above cases the man half of the man-machine network is static. He simply wants to know something; his subsequent actions will probably be quite independent of the machine. In the third class of situation, the man and machine wish to interact. The machine on request shows the man the information desired (*eg*. the status of given process) and the man alters the picture shown to him. He changes the argument. This is dynamic information monitoring. The man and the computer work together, each supplying what he or it is best suited to supply until the solution to the problem is reached.

The design approach now being taken to meet this third situation is that of using a light gun or pencil by the human monitor which deflects the cathode ray tube beam to a desired valve on a graph. The change in beam positioning in turn tells the computer that a different output is desired and the computer in turn automatically changes the other problem variables as required.

Thompson-Ramo-Wooldridge, IBM, and the Mitre Corporation are all conducting development work on this process. It has been in use in a limited fashion in the American SAGE early warning system for some time. A light gun can be used in that system to set in motion the calculations necessary to destroy an unidentified object on the area map displayed on a cathode ray tube.

A PICTURE OF TOMORROW

A less disturbing example would be the use of dynamic monitoring in a manufacturing inventory control program. The computer, on the basis of historical sales, order lead time, and minimum inventory level data, would generate pictures to display for a future time period:

—*what unit (or dollar) sales will probably be accomplished*

—*what the production schedule must be to support such sales and inventory position*

—*what the investment in raw materials, work in progress and inventory must be*

—*what the company's cash flow will have to be to support such volume*

—*percentage of plan capacity available and to be utilised.*

Suppose then that a very large order for goods is anticipated for a period of four months hence. The human monitor would 're-write' the orders displayed on the cathode ray tube for the time specified, and the computer would proceed to alter the supporting elements (production schedule, materials inventory, cash flow, etc). However, the size of the order entered results in displays which indicate that delivery of the finished goods is impossible or unprofitable under the parameters of the manufacturing operation. The human operator must now try a series of cut and fit experiments until he reaches some optimum solution. In a sense, he 'argues' with the machine.

Yet in order to be able to do so he would need a highly complex situation displayed to him in a manner that he could deal with, and he would not have to be interested in intermediate results.

This concept of dynamic monitoring suggests the possibility of real-time simulation of business problem solution. Further, it will be a valuable tool in the use of such advanced business control techniques as market simulation, operational gaming, and distribution planning.

A display system capable of serving the dynamic monitoring process has been built by the Thompson-Ramo-Wooldridge Company—the DA-400. This unit contains three cathode ray tubes. Two are 17 inch tubes and one is a ten inch tube. The larger ones are used for the graphic display of lines, dots, and special symbols. The smaller one is used to display tabular information in alphanumeric form. Control elements include a keyboard and

thirty process step keys. The functions of these keys can vary according to any one of 64 possible overlays, which, when inserted on the keyboard, serve both to label the keys for the operator and to specify to the computer the program used in interpreting the requests signified by the keys. Two other control devices are mounted near the keyboard: the light-gun and the joystick. The function of the light gun has already been touched on. The joystick controls the movement of a cross-hair marker, used to single out a display area, rather than a single point.

MILITARY ARE PIONEERS

Although there is no installation contemplated in the near future for the use of a dynamic display system in a commercial application of the type indicated, several branches of the Department of Defense are designing systems which approximate to the one outlined. Taking into account the normal lag time between military data system developments and their adaptation for commercial use, the latter half of this decade will see strong business management interest in such systems.

An example of present developments in the military is a programme now being undertaken by one of the defense agencies that will permit top commanders to have immediate access through display panels to such current information as the status and disposition of all forces and the status and disposition of aircraft and weapons. The same display unit could be used in less hectic moments to display the progress status and expenditures on any contract under that command.

Display systems of the large screen projection type are under development by a variety of contractors for command control systems, intelligence data handling and analysis systems, and for combat operations centers. These types of systems generally require the ability to portray maps as shown in the illustration on page 22 or to portray abstract forms, such as the nuclear bomb test patterns.

More peaceful uses of data display systems now being planned are for air traffic control systems and for weather mapping services. In the former case, display systems will allow traffic controllers to follow the anticipated computed routes of operating flights and to simulate the effect of changes in routings or flight characteristics of one or more flights in the sector under surveillance. In the latter case, the use of display devices will allow weather service personnel to follow the effects of computed paths of weather forces or disturbances—in a nutshell, to predict the weather better.

The weather display application is now under intensive study by the Federal Aviation Authority. When a complete data integration and analysis system is designed, it will be possible to service all military and commercial air operations control points with real-time displays of both current and forecasted weather activity. It is not difficult to envisage the extension of this service through display devices to newspapers, television broadcasting stations, and agricultural information centres.

The concept of the ' design machine ' brings us back to a display system which allows an effective partnership between human and machine, enhancing the abilities of each. Similarly, it avoids the danger of becoming restricted by the necessarily limited information available to the machine, and by the machine's limited imagination.

FREEZING THE PICTURE

In almost all of the display device applications outlined above, the picture displayed may become of such interest that the operator wants a copy of the picture. The devices that make this possible are available. They are of two types—the photographic negative and the direct electrostatic printing method. The latter method is typified by the Stromberg-Carlson Xerographic printer, the AB Dick Videograph and the Rank Xeronic printer. The former method is served by such equipment as the Eastman-Kodak DACOM.

It must be emphasised, however, that the character generating display device competes directly with conventional printing methods for many applications. In the information retrieval situation, the remote monitor printer is cheaper and provides either a permanent log or a carry-away message. Factors which would favour a digital display device over printed ' hard copy ' display are:

1. The displayed information is complex and interrelated; format is widely variable.
2. The displayed information is desired very quickly.
3. There is not necessarily a need for a permanent record of the display.
4. The information is desired in graphic form.
5. The ability to experiment with or partially change the displayed information is important.
6. It is desirable to superimpose one display upon another.

With these factors in mind, an important future can be envisaged for digital display devices. Their greatest period of growth lies ahead—in the wake of the development of adequate computer communications devices and of effective random access information retrieval technology.

What Can You Learn By 'Home Study'?

A small number of correspondence colleges provide courses on computer programming and data processing—

Maboth Moseley

OUT of a dozen or so well-known correspondence colleges, there are at present only three that run courses on computer programming or data processing or that include these subjects in accountancy courses, while a fourth has recently discontinued its course. It seems that while correspondence courses in accountancy, economics and in technological subjects like electronic engineering are popular, computer 'know-how' acquired by 'home study' has still to catch on.

The explanation is partly lack of demand, as training is provided by the computer manufacturers for those who will work with their machines, and partly to be found in the rapidly changing situation. Also, it seems that at present there is a dearth of people sufficiently interested in the general theory to pay out of their own pocket for a course of instruction.

Yet, it would appear that if in the next few years the increasing demand for computer personnel is to be met, the correspondence colleges might well have a role to play. Already, within the next few months one or two computer manufacturers are going to find their customer education facilities taxed to the full.

Of the courses available, 'Computer Courses' are under the direction of Mr Kenneth S Most, LLB, ACA, who represents Business Electronics Inc, of San Francisco, members of the American National Home Study Council. For taking these courses, it is claimed, no previous experience of electronic computers is required, no special courses in mathematics, no training in engineering and no special accounting training.

Course 101, Programming for Business Computers, consists of study and workshop assignments. In the first, the computer is explained, together with different techniques of using it. Practical experience in programming problems is given in workshop assignments.

A specific theoretic computer, 'BEC', has been designed. This combines the best elements of several business computers actually in operation, although in the assignment on hardware the Remington Rand Univac, IBM 705 and 650, and Burroughs Datatron 205, are described in detail with command lists and illustrations. Similar data on British machines are included in a special supplement—Leo II, Pegasus 2, Elliott 405, Deuce, Emidec 1100 and others. Course 102 is on programming the IBM 1401 data processing system, and this includes a specially prepared study guide, authoritative IBM texts and working papers.

A number of British firms have enrolled their employees in Course 101. They include C T Bowring and Co (Insurance) Ltd, Crane Ltd, Co-operative Wholesale Society Ltd, Johnson Matthey and Co Ltd, Charles T Robey Ltd, Rubery Owen and Co Ltd, Scottish Co-operative Wholesale Society Ltd, as well as nationalised industries and practising accountants.

The price of the straight programming course is £49, and the special IBM course is a few pounds more expensive. Mr Kenneth Most says: 'We have about 25 people completing the straight course, but have not yet advertised the IBM course in Britain. Our American counterparts have trained over 2,000 students since 1956.'

'I like to think that there is a large pool of imaginative people who will be well served by a correspondence course of this nature,

but I know that I am wrong. We enrol about one applicant in 20, partly because those who apply cannot afford our fees and partly because they are unable to meet our standards. In spite of this, the need exists.'

International Correspondence Schools Ltd run a Computer Programming Course and an Electronic Computer Course, also a combination of these two as a Data Processing Course. These are comparatively new courses and, says Mr E R Andrew, Principal, 'although we hope they will develop, we are not at present playing a very large part in the training of programmers. At present, correspondence courses are available to help persons who wish for training in this rather specialised work and cannot obtain it elsewhere.'

Mr D L Carr, GradIEE, AMBritIRE, AMInstW, is head of this college's department of electronic, radio and electrical engineering studies. The Computer Programming Certificate Course covers the elements of a computer; principles of programming, computing and coding; binary and octal number systems; address computation; flow charting; input and output methods; magnetic tape programming; programming techniques; automatic coding. For illustrating these techniques a 'typical' computer (TYDAC—for typical digital automatic computer) is used in the text book.

The essential background knowledge of mathematics, office procedure, accounting principles and the writing of reports are covered in this course, and it can be abridged by special arrangement for executives whose staff operate electronic computers.

Although the School of Accountancy, of Glasgow and London, does not conduct courses in computer programming, it includes brief articles on the relevant aspects of data processing throughout its courses in book keeping and accountancy, auditing, office organisation and method, general commercial knowledge and so on, 'sufficient, we feel', says Mr J C Crawford, BSc (Econ), CA, Director of Studies, 'to enable our students to deal with the questions of a general nature set by the examiners. We also operate a short course on machine accounting,' he added. 'To this we have recently added a single lesson on the basic principles of data processing.'

SECOND OPINION

What do the computer manufacturers think of correspondence college courses? Mr A R P Fairlie, technical training executive, of the Univac Computer Division of Remington Rand Ltd, says: 'A course to acquaint students with the theory of computers, to illustrate what programming is about and how it is performed on different types of machine might well be useful to a person on management level who required to understand the theory of computer work without having to perform any actual programming. Most computer manufacturers will, however, offer appreciation courses of this kind to management personnel—frequently free of charge. Theoretically a correspondence course should have the advantage here that it is free of bias.

'Moreover, in a rapidly changing field such a course must inevitably offer generalisations which are only partly true for a specific piece of equipment, or which may be totally false in the light of last week's development. It is of course easier to revise a correspondence course than to revise a book, but again the extent to which any book is up to date is a known factor—with a course this depends entirely on the energy of the promoter and the coverage of new equipment and techniques which he can command. In fine, managerial personnel may find a course of this kind useful: it will be dangerous if it is regarded as anything more than an introduction to the subject, or if its teachings are considered as more than tentative conclusions, to be confirmed or corrected by direct contact with one or more computer manufacturers.'

It would be dubious, Mr Fairlie believes, to claim to teach the art of programming to such a level that the student could thereafter readily learn to program any computer from a quick survey of its specifications with only minimal further instruction. The ability adequately to program any computer depends on three things: (1) An understanding of the theory of programming. (2) A thorough knowledge of the computer concerned. (3) Practice. In the last analysis, programming was 60 per cent practice. The finest theoretical programmer in the world was quite useless until he could run and correct his own program on the computer.

The person most likely to benefit from a correspondence course was the young man wishing to decide whether or not the computer field was suited to his particular talents. Such a person might well find it difficult to obtain a place on a manufacturer's course and could gain a real appreciation of what this field of work was all about from a correspondence course. It should, however, go without saying that it was very nearly useless to give a university graduate a course designed for a business executive, even where the end product desired by both was similar.

Mr Fairlie points out that 'programming is not a well defined field—*eg*. where does systems analysis end and programming begin? The answers traditionally given to this question are about to undergo a major revolution with the advent of automatic coding. When this becomes a reality in the field, as it already is in the research laboratories, the work currently being done by the systems analyst will of itself define the program.'

Robert McKinnon

How the Alliance Expanded-Without Strain

Business increased by 100 percent but with a mechanised accounting system at work this involved no more than a 30 percent increase in staff

IF only the large building societies are likely to contemplate using computers (as was suggested last month in the first article in this series) that does not mean that there is no scope for modern data processing techniques among the smaller units. One medium size society, for example, has been using a punched card installation to great advantage since 1953.

The society in question is the Alliance Building Society with headquarters at Brighton and 24 branches dispersed throughout the country. It employs a total of 405 people of whom just over 320 are engaged on clerical duties. It estimates its total annual bill for salaries and expenses at £300,000, a figure which includes the salaries of directors, managers, branch managers and representatives, as well as clerical and accounting staff. Even if the society were to instal a computer, probably no more than 50 of its staff would be affected. Thus even though the proportion of managerial and clerical costs to total operating costs is high in any building society, a computer would not necessarily cut this proportion appreciably.

Alliance operates a complete, centralised accounting system, its branches merely carrying out cash transactions and loan negotiations for which all accounts are maintained at head office. When the society went over to a punched card system, it had a total of 55,000 accounts and 14 people involved

in their maintenance. Today, it has 112,700 accounts of which 68,700 are investors' accounts and 44,000 borrowers' accounts whose upkeep is maintained by a staff of 18.

Before touching on Alliance's current punched card system, it is worth noting that the society is very much alive to the possibilities of using a computer. It has already conducted a feasibility study and is to undertake another shortly. However, the first study indicated that operating costs would go up by £20,000 annually after allowing for savings in staff costs which would not be realised for some years. Another version, a much less flexible installation with fewer development possibilities, was studied; this indicated increased operating costs of £10,000 a year after taking prospective savings into account. For the moment, then, the society sees no reason to change from its punched card installation.

This installation works on Powers Samas 40-column punched card machinery; that is, it uses five types of machine—card punch, verifier, sorter, interpolator and tabulator. In actual fact, there are three tabulators, but for the sake of clarity we shall write as if there was one. The jobs handled by this machinery are keeping borrowers' accounts up to date every calendar month and investors' accounts up to date as the need arises but at least once every six months when interest payments fall due.

The main items of information punched on to the cards for feeding through the system are as follows:

(1) *Investors Accounts*—account number (that is, a member's register number plus the first three letters of his surname), date of the entry, type and amount of entry (debit or credit), and interest thereon, and source (that is, which branch office).

(2) *Borrowers' Accounts*—account number, amount owing, amount paid and the amount of monthly instalments in arrears.

Under the system, a fresh card would normally have to be punched for every transaction on an investment or mortgage account. Where, however, the same transaction takes place month after month, the same card can be used again and again thus saving the time and cost of creating a fresh card. Examples of such transactions include the debit of a monthly instalment and the annual insurance fire premium.

On either type of account the whole operation begins with records of transactions being sent to head office. The first piece of data processing equipment involved is of course the automatic key punch. A batch of unused cards is placed in this machine and, as the cards are fed in one at a time, the operator punches the information from the written record on to a card. The machine, it should be added, can be set up to repeat the same punchings automatically on to a batch of cards.

Each card goes through the punch twice, the second operation being, of course, a check on the first. Invariably, another operator does the check punching to reduce the chance of an identical mistake being made. After punching and check punching, the cards are put into the automatic verifier which throws out any card with a round hole, this constituting proof that the card in question has not been check punched.

The next stage is the sorting; the cards are put through a machine which can sort punched cards at the rate of 40,000 an hour. However, it can only sort one column on the cards at a time, so the cards have to be fed through six times—one for each digit of the account number. (Alliance, incidentally, have found this machine especially useful at the year's end when it is used for sorting cards into various ranges of mortgage balances in order to provide an analysis of these for the balance sheet.)

The interpolator is used for collating one bunch of cards with similar cards from another pack. For instance, cards are punched for every payment received, and these will of course show the member's register number and the first three letters of his surname. The machine can therefore sort any card relating to a particular day's payments into the main pack of cards so that each is linked with its counterpart relating to the same member. The machine will also insert ' new ' and remove ' old ' cards at the same time.

Tabulator operations are generally the final stage of the operation. The machine prints out in plain language at the rate of 80 cards a minute any part or all of the information on the cards; this for a variety of purposes such as ledger card, interest warrant, annual statement and so forth. At the same time, the machine's arithmetic unit is calculating sub-totals, accumulative totals and grand totals, as required. It also calculates the new balance of a member's account after a current transaction, and can punch—by means of an attached summary card punch—a fresh card showing that new balance.

Looking at these operations more closely, it is important to remembei the part played by the interpolator. Through this machine punched cards relating to transactions or entries on accounts are inserted from day to day in the main pack of ' balance ' cards. In this way all the cards relating to the same account can, as stated, be kept together.

BORROWERS' ACCOUNTS

An ordinary ' plain figure ' ledger is kept for each borrower. The ledger is in the form of a card, these cards being kept up to date once a month by the tabulator via punched cards. The job is done for sections of accounts according to a monthly

QUOTE

'We find that on schemes and costs submitted to date, a computer would be an expense and not an economy.'

timetable, after which the whole pack of punched cards is passed through the tabulator. By means of lighted numbers, the machine shows the register number of the next punched card going through. The operator then inserts the appropriate 'plain figure' ledger card, whereupon the machine posts to the ledger card all the entries represented by the punched cards concerned and calculates and prints the new balance. Simultaneously, the summary card punch will prepare a new punched card showing, among other things, the latest balance for that ledger account. This new punched card forms the starting point for the next month's transactions on the account, and is known as the 'balance card'.

There is also a standing set of punched cards—one for each account—with details of the borrower's account number, the name of his insurance company (in code) and the amount of the insurance premium. Each year in October, when these premiums fall due, the cards are interpolated with the main batch. After being posted to the borrowers' 'plain figure' ledger cards, the insurance cards are re-sorted and grouped together by insurance companies. In this way the tabulator prepares a list with totals of premiums due to each insurance company.

There are punched cards to cover a number of borrower transactions as well as insurance. For example, each borrower has a card which records his current capital balance and arrears, if any, in his monthly instalments. He also has a punched card showing the amount of the monthly instalment; these are sorted in with the balance cards each month and re-extracted—after they have been tabulated—for re-use in the months to follow. Third, there is a punched card for each repayment. Such cards are punched daily from receipt dockets and the total, after sorting and tabulating, agreed with the amounts banked by the Society's cashiers. In addition, cards are punched for such items as fines, incidental payments, legal costs, advances and further advances.

INVESTORS' ACCOUNTS

A card is punched for each investment received showing not only the amount of the investment but also the interest on the sum computed to the end of the current half-year. A similar card is prepared for each withdrawal. These are known as 'movement cards' and postings are made from them by the tabulator to 'plain figure' ledger cards which are kept for each investor. There is also a punched card for each investor showing his current capital and interest balance with a coded punching to indicate whether he wants his interest to be paid by warrant every six months or whether he wishes it to be compounded.

Periodically, the balance card for each investment account on which there has been a transaction is extracted and collated with the relevant 'movement card'. Cards are then passed through the tabulator for posting to the 'plain figure' ledger cards of the investors concerned. Simultaneously the tabulator produces a 'new balance' punched card for each account affected showing capital and interest balances. This card forms the starting point for future transactions on the account and is filed in the main pack of balance cards in place of the card originally extracted.

Alliance points out that a very great advantage of punched card accounting in building societies is the ease with which investors' interest warrants and statements can be produced. When the time comes for preparing interest warrants, there is already in existence a punched card for each investing member which gives the capital balance and the interest due at the end of the current half-year. These cards are fed through the tabulator which automatically prints the relevant figures on the warrants which are in the form of continuous stationery. Investors who wish their interest to be added to their capital have their statements prepared in the same way.

While interest warrants are being prepared, the summary card punch is producing a new balance card as a starting point for the next half year. For members who compound their interest, a punched card which records interest due is prepared. This, in turn, is used to post the interest to the 'plain figure' ledger card during which operation the tabulator produces a new balance card showing-as in the case of those who receive interest warrants, 'capital balance only'.

A second advantage of the punched card system is that it saves a considerable amount of clerical work on interest calculation. After the new balance cards have been created, the sorter arranges them into ascending capital balance order. The effect of this is to group together all those accounts with balances of, say, £10, £11, £12 and so on upward. The operator thus finds that she has to punch in the same interest sum to an appreciable number of adjacent cards; and, as pointed out already, the

LEICESTER PERMANENT TAKE THE PLUNGE

Although, as was pointed out last month, no building society has computerised its operations to date, it has just been announced that the Leicester Permanent Building Society has ordered a computer. The first society to announce such a move, Leicester Permanent intends to put the whole of its mortgage and investment records, together with ancillary jobs such as staff salary accounting onto a National 315 computer, which is to be installed at head office in Leicester.

A feature of the society's computer system will be a random access store in which mortgage and investment records will be stored. Thus the society will be able to process branch transactions in random order just as soon as the details are received at the computing centre.

Having grown rapidly in recent years, the society's new 'automatic book-keeping system' is designed to accommodate very substantial increases in the volume of work.

key punch can be set to repeat given figures automatically.

Thus, the cards pass through the automatic key punch very quickly. This done, they go to the sorter once more for re-arranging into Register Number sequence.

In the experience of Alliance, which was the first society in this country to go over to punched cards, there are times when a tabulator has excess capacity and there are ' peak ' activity periods when one machine is barely enough. A smallish building society with not more than, say, 40,000 accounts, could probably cope with one machine only, but an adequate margin must be kept in reserve for peak periods. Again, one cannot discard the possibility of a temporary breakdown in the equipment, in which case a society with only one tabulator might find itself in trouble.

So far as Alliance is concerned, the society feels that with three tabulators it is well equipped to meet any emergency. Moreover, their system has enabled them to make appreciable staff economies, not by sackings, but through not having had to recruit as many extra staff as would have been necessary under the old system to deal with expanding business. In eight years the society's business has gone up by more than 100 percent, yet their accounting staff has increased by less than 30 percent.

As stated in the beginning, the society has not dismissed the possibility of going over to a computer, though on schemes and costs submitted to date they are convinced that for them such a step would be an expense and not an economy. But Alliance are remarkably free from any prejudice in the matter, so their opinion that there may be a case for a computer in large societies with centralised accounting systems is well worth considering. How a computer installation could be used in such a society will be discussed next month.

JOB MARKET REPORT

Mr O and M

His career and prospects, according to the classifieds

BY piecing together a number of newspaper advertisements the figure of the Organisation and Methods man begins to emerge. He begins his studies at about 21, having obtained his Ordinary National Certificate in engineering or having gained an accountancy qualification. At 23 he can expect to receive a salary of £700 plus. (Milk Marketing Board, 7 May.) A degree and professional qualifications are an advantage (NCB, Durham, 3 May) but not as important as experience (Liverpool firm, 7 May). He has to carry out detailed investigations, prepare reports and assist implementing his findings (NCB). He has to be able to analyse the activities of accounts, stock control, and production control departments (East Anglian Engineering Company 1 May) and be able to interpret figures logically, with a knowledge of statistics (Bird's Eye Foods, 8 May). By the age of 30, he could expect to be in the salary bracket, £1,300 - £1,825 (NCB). By then he would be expected to have a knowledge of punched cards and be able to determine where such systems can be economically applied (East Anglian Engineering firm). He would then be required to participate in computer studies and to do systems work (Richard Thomas and Baldwins, 10 May). His next step up would be to chief O and M officer, when he would expect to receive a salary of not less than £1,500 (Crompton Parkinson, 9 May). He should then be fully experienced in designing and installing complete new systems in offices and factories for a large organisation (Crompton Parkinson). His next step up would be to Group O and M officer, when he would have executive responsibility direct to the Managing Director through the Company Secretary of the group's parent company. His salary would be rather more than £2,000 per annum. He would co-ordinate procedures and office methods throughout the group, comprising several operating companies both at home and overseas (Chloride Electrical Storage Co, 8 May) and would contact and direct O and M officers in all the various companies. He would travel extensively to all the companies as a sort of overseeing arbiter. Basically, then, the O and M man starts with an enquiring mind, an ability to put things across (Gillette Industries, 29 April). He has certain basic academic and technical qualifications. He then has to keep one foot in the present, knowing what the existing systems are and the short-term improvements; and to follow up all the new techniques from machine accounting, and punched card operation to computerisation, so that when management takes the jump into the deep waters of computer practice and planning, he will be able to lead the feasability team. The O and M man is not usually the man who pioneers the introduction of the computer, but he is nearly always the man whom top management summons and says ' You'd damn well better make it work! '.

* * *

The consultancy business seems to be booming. Urwick Orr again require men, 30–37, for home and overseas appointments; basic requirements qualification in engineering, technology and professional fields plus five years in a responsible post in industry. Training at the Urwick management centre is given, to equip consultants for the diagnosing, sorting out, presenting and implementing management solution. A partnership share scheme is in operation. Management Succession and Developments Ltd require men, 33–50, for management structure analysis and training programme appraisal and introduction. O and M experience is mentioned—as useful background specialist knowledge. Robson, Morrow and Co require qualified accountants with experience in the computer field, if possible. Good practical knowledge of punched card work is needed, and if possible a period of training with equipment manufacturers. Associated Industrial Consultants, who require consultants experienced in OR, with mathematical, statistical or engineering qualifications provide a welcome breath of reality in the form of a salary scale. Initial salary £1,700–£2,100 with pro-

gressive salaries up to £2,700 is their bait, with 'opportunities for considerable advancement in salary'. Training at the AIC college of management is promised. An Australian company required a EDP consultant with sound experience in programming and systems operation. Graduate or accountant preferred, 28–34, who is offered the prospect of doubling his salary in five to seven years. And CEIR, the consultant and research organisation of all, are making their first bid in the job market, for a computer programmer. Candidates 'must understand the language of mathematics' and have some programming experience; knowledge of autocode systems would be useful. Training in programming IBM 7070 and 1401 computers is offered; salary is said to be excellent, and opportunities limitless.

Training officers and instructors are in demand, solicited both by IBM and AEI. AEI have had quite a field day of recruitment since they also advertised for a Chief Works Accountant responsible for applying computer techniques (for their Hotpoint organisation) and for both computer programmers and operators. De la Rue Bull Machines Ltd required a Commercial Manager —salary not less than £2,500, life insurance and car provided. The Commercial Manager will supervise the commercial syllabus of the training school, as well as being responsible for systems advisers and programmers, and the control of the sales organisation and client and public relations. De la Rue Bull will put him under the whip for 12 months training. Age limit 30–40, professional or academic qualifications required plus a knowledge of French.

There were, during May, vacancies for 11 programmers, two for Australia (Department of Defence and English Electric) and one for Rhodesia. Trainee programmers are also required by Formica Ltd and CAV Ltd (20–25 GCE A level mathematics, starting salary £700); and fully fledged programmers for Richard Thomas and Baldwins, BP, AEI, and Milk Marketing Board. There were eight vacancies for operational research experts, including one for a lecturer in management studies for the College of Aeronautics (£1,900–£2,425). A mathematical statistician for operational research at the Cotton Silk and Man-Made Fibres research association was offered only £1,000–£1,500, but was given the opportunity of working on his own initiative. Supervisors for punched card installations were required at Cambridge University for the local examination syndicate (£815–£1,080); by a city newspaper group (£1,000 plus); by the British Ermeto Corporation (Burroughs system for stock records) and by Associated Television (ability to plan new systems essential).

In sum, a full month for almost all categories.

BOOKS REVIEWED

An Introduction to Electronic Data Processing for Business by L E Hein. Pp. 309. D Van Nostrand Co Inc. New York and London. (1961) Price 56s.

This book has been written as a text book for American college and university students, especially those taking business courses, and hence by extension to businessmen interested in computers. The author is associate professor of business administration at Los Angeles State College, and the book is based on his lectures. The book attempts to be only an introduction to computers.

The first two chapters define certain basic computer words and ideas, and explain a computer in terms of the usual five parts—input, memory, arithmetic unit, control unit and output unit. Professor Hein then has three chapters on programming a computer using an actual order code and machine system. There follows one chapter on flow-charting before the topics covered are put together to tackle two business data processing problems. These problems are payroll and stock control, and a chapter is used for each, including some detailed coding. The problems of file maintenance, sorting and report writing are discussed in the next four chapters, and the last chapter is concerned with what the book calls 'Advanced Programming Concepts'.

I think it was a mistake to choose the IBM 650 to teach general programming concepts. The 650 is a reliable and widely used machine, but it contains none of the features that have appeared in the latest data processing machines such as the 1301, 1401, Orion or 315, and it first appeared many years ago. Therefore anyone learning general programming from it in 1961 will be misguided in the ease and possibilities of processing commercial work. If the idea was to teach not general concepts but a particular machine then this has already been done better in the maker's manual or in R V Andree's book 'Programming the IBM 650 Magnetic Drum Computer and Data-Processing Machine'.

The book is more useful when actual coding the two business problems and will show the average executive the detail required in coding—though of course only simplified problems can be used in a text book. The information in the chapters on sorting and merging is also interesting, and though

not new does give prominence to topics that are often neglected. But most of the difficulties the author encounters in these pages are due to the computer he is using—especially the lack of a fast store—and are not general problems for they could be more easily treated on modern machines.

The last chapter—' Advanced Programming Concepts '—is really a misnomer. Part of it contains elementary de-bugging procedures and for the rest SOAP and FORTRANSIT are shown as almost the latest in automatic coding systems. There is no mention of COBOL, CONTRAN, FACT or work on more advanced systems, and the latest reference in the bibliography is for 1957.

To sum up, I think the book is simply written but contains nothing new and much that is out of date. It may suit its original purpose, of teaching college students admirably, but there seems little reason to publish it in England for the businessman. This class of reader would be better advised to read a book such as ' Automatic Data Processing Systems ' by R H Gregory and R L Van Horn.

R MURRAY PAINE

Sales Accounting Methods by R H de G Matley, BSc(Econ). Pp. 156 The Institute of Office Management, London (1961). Price 35s.

Sales Accounting as a business operation is something about which nearly everyone has practical experience. It is so much a part of a business from the beginning of its existence that it is very much taken for granted. However, there must be very few people who have practical experience of this operation in all its forms, from manual and simple mechanised systems right up to computer level. That is why this latest publication of the Institute of Office Management, the successor to their best seller, ' Invoicing Methods ', is so useful, both to the student and the manager or organisation and methods man, who may have to review, expand and revise an existing sales accounting system. At what point they must ask, are multi-register machines or analysis machines economical; when is an organisation big enough, and the throughput of information large enough to justify a punched card installation? The comparison of the various methods is provided in this book.

I was struck by its simplicity, clarity, and logical presentation. This book was fathered by a select committee of nine, including executives from J Lyons, Unilever, John Lewis, and the Treasury. Considerable credit for the able scissors and paste-work, and for the excellence of the style and layout, must go to Mr Matley who has assembled no less than 24 case studies, to illustrate the usage of the various methods. First he defines sales accounting—the accurate charging of goods to the right customer; the collection of payments according to the agreed terms, the recording and accounting for money received; and the presentation of management statistics, and information for credit sanction and for auditing regarding debtors and sales. Thereafter there follows sections on the classical and modern sales accounting methods, a section on planning procedures, and then the whole gamut of sales accounting systems, manual, three-in-one, machine aided (using typewriter and add-lister) keyboard accounting machines, one, two, and multi-register machines, analysis machines, punched card and calculator methods and computers. Each one of these methods is clearly illustrated, both as to the hardware and to the forms involved and is accompanied by one or more case studies. Following these chapters are reviews of specialised methods, ledgerless accounting, HP, export sales and audit considerations.

Examining the two chapters on punched cards and computers I found that in the former section rather more attention is paid to the hardware aspects of the systems. The three methods of sales accounting are described, ledger card, balance card, and open item, and there are two case histories, Open Item (H J Heinz) and Balance Card and Open Item (J R Flemming). The chapter ends with a review of the general advantages and disadvantages. Another punched card application is given later, in the specialised chapter on hire purchase accounting.

The chapter on the computer, after defining the computing combined operation and common language principles, is mainly concerned with the two case studies: first, the sales accounting, invoicing and statistics preparation system used by W D & H O Wills (Leo IIc) divided into seven heads—taking in orders and payments, producing kind and nominal account totals and summary invoices, producing selling period statistics, area calendar month statistics, customers' permanent and temporary data, and audit totals.

The second case study is that of Norwich City's general rate and water rate charges system, using the Elliott 405. This describes the five stages of the operation, setting up initial records, producing half-yearly demand notes, amending basic information and recording payments, follow up arrears, and producing the rate books. There is no summary of advantages and disadvantages of the computer.

In addition to the body matter of the book, there are three appendices, and most valuable being a two page bibliography on all the systems and all equipments involved under the various chapter headings—planning sales, ledger, machine accounting electronic computer. The computer section of the bibliography is a little sparse, and dated; there are no books mentioned published subsequent to 1958; but this is a minor blemish to an otherwise excellent and valuable work of reference.

DAVID ROACH PIERSON

Data Transmission Systems

WITH the growing trend to centralisation that computers effect in widespread organisations, the need for rapid data communication will become most apparent. An organisation receiving orders from several different countries needs to be able to plan its production schedule; airlines need details on seats available on their various flights to be communicated to several points; warehouses need to have facilities to receive and answer stock queries from remote offices, etc. With very large organisations with more than one computer there may be a need for direct interrogation on line between two or more computers, and for interchange of stored information from magnetic tape stores in different parts of the country.

All these applications have been discovered in the USA and suitable systems designed. In this country, however, the distance factor is not so great. Transmission systems as exist in current usage are mostly slow-speed systems, punched tape teleprinters, or facsimile transmission systems, whose transmission speed is no more than 60–100 words per minute. These systems include tape teleprinters, page teleprinters, typing reperforators, non-typing reperforators, manual perforators, and for central installations, torn tape switching equipment push button switching equipment or fully automatic switching equipment. These equipments are for the most part designed to the specification of the GPO. The hardware for these systems have been described in other sections of this survey . (See January and April 1961 issues.)

These slow-speed systems, however, are too slow for direct communication with a computer, even though the computer makes use of buffering and time-sharing devices. So a number of medium to high speed transmission systems—punched paper tape-to-tape systems, punched card-to-card systems, magnetic tape-to-tape systems, and computer-to-computer communication systems are beginning to make their appearance. In addition to these systems there are others at the drawing board stage, notable among them systems designed by Elliott Automation, Ferranti and Siemens.

In every data transmission system, there are usually distinct devices: the input and output equipment—in their simplest form a tape reader and tape punch; the data conversion device which converts from systems coding to communications coding and into which the error detection or error correction device is often built; the modulator-demodulator which causes the communication pulses to be transmitted over the communication channel and received at the remote end; and the communication channel, the telephone, telegraph or radio line or link.

In this country all data transmission is carried out over lines provided by the GPO. This is the extent of the GPO's responsibility; all the other equipments are provided by the private manufacturer, and provided these devices meet with the basic specifications laid down by the GPO regarding safety, freedom from interference, etc, they do not need to be to any set standard.

There are six broad categories provided by the GPO; the ordinary public speed lines and telex lines, private lines of medium quality circuits, with amplifying devices and channels in a carrier system for ac transmission, known as Tariff D lines (Tariff charge £12 per dial mile per annum). The most usual channel for data transmission is the private circuit of high quality, known as the Tariff E line, which has the necessary freedom from interference and error incidence; in this category would be included one-way music circuits, with transmitting bands of 50–6, 400 bits per second of 50–8,500 bits per second or even exceptionally 50–10,000 bits per second. Data transmission via telegraph circuits, Tariff H, requiring dc signals over the local ends, and costing £12 per mile for the first 25 miles and lower rates for additional mileage (less than £1 a mile for distances over 200 miles) is also a practical possibility. Co-axial cables giving bandwidths of 60–2,852 kc/sec or 60–4,340 kc/sec and wider bandwidth circuit facilities of the order of 12–60 kc/sec, 60–108 kc/sec or 12–08 kc/sec are also provided by the GPO, and also several forms of television circuit for particular requirements. A bandwidth

of 48 kc per second can carry 12 telephone channels. This could allow information to be transmitted at 15,000 bits per second.

DIRECT INTERROGATION TRANSMISSION USED BY AIRLINES

The Transactor data transmission equipment.
Maker: Ferranti Packard Electric Ltd (the Canadian subsidiary of Ferranti Ltd).

This system uses standard telephone or teleprinter channels to connect up a transactor at a remote station with a central computer. The transactor is an interrogation reply device, into which graphite marked cards are fed and sensed, and the reply to the query punched by the action of the computer.

The operation begins when the enquiry card is inserted in the slot of the transactor at the remote station. This card is similar in size to an 80-column punched card, but has circles instead of digit columns, giving a total of 286 basic positions. The cards are marked in pencil to enquire as to the availability of seat places on the various flights. A combination of these marked positions serve as identification code, enabling the computer at the receiving end to select the appropriate program.

The transactor senses the marked cards and converts the data to signals which are transmitted via a telephone or teleprinter line to the coupler-buffer. From there they are taken in by the computer, which automatically selects the correct program, and the enquiry is made to the appropriate memory store holding flight details. The reply as to availability—either yes or no—is retransmitted from the computer to the transactor, causing a notch to be made in the enquiry card. The time taken on reading the card, transmitting to line, processing, return-transmission and punching into the card is about 3 seconds.

Checking facilities consist of a parity check, a parity digit being added to the 12 digits of information read by the transactor. This parity digit is checked at the coupler-buffer, before data is passed in to the computer, and if incorrect the signal is rejected. Other program and built-in checks can be made in the computer, as required.

The system is capable of operating with any computer system, provided it has adequate memory store and fast memory access. The makers feel that this system could be used for retail store, data collection, manufacturer's stores control, in mail order firms and in a number of other applications.

The Stantec Airline System
Maker: Standard Telephones and Cables Ltd

This system comprises a central information store, a magnetic drum store with 1,000 bit positions on 320 tracks into which will be fed information on flights up to 20 weeks ahead.

The outstation will be a push button keyset unit operated by a sales clerk. This will be used in conjunction with metal flight plates, issued to each remote station from the control centre. These plates are printed with coding to cover standard flights information.

The information store is invoked by the pressing of the 'ask' button on the keyset. This will cause the interrogation information to be transmitted down telegraph circuits to the store where it is buffered and fed to the drum. The store is able to indicate 'open for sale' 'request' (where limited seating exists) and 'waiting list'. This information would be re-transmitted to the outstation and shown by a pattern of lights on the keyset.

The transmission and return of information between an outstation and the central store takes a few milliseconds, when there is a direct wire from the keyset to the computer, and to two to three seconds on the telegraph circuits, where transmission is at normal teleprinter speeds.

Since the length of message is always known, error-detection is carried out by a single pulse-counting check at other end. If the message is the 'wrong shape' the store rejects it, and re-transmission must take place.

DATA TRANSMISSION SYSTEMS WITH PUNCHED TAPE INPUT

The ATE Swift systems (ref; PT 750 PT, PT 1500 PT, PT 2500 PT)
Maker: Automatic Telephone and Electric Co Ltd.

These systems, which as their designation suggests transmit at 750, 1,500 or 2,500 bauds (bits per second), are medium-speed transmission systems using private voice lines Tariff D or the public switching network in the case of the lower speeds, and high-grade Tariff E private lines for the higher character transmission (2,500 bauds).

The input and output equipment are the Ferranti TR5 tape reader or other photo-electrically operated reader, and the Teletype BRPE tape punch, operating at a speed of 100 characters per second. The tape input and output can be either 5-, 6-, 7- or 8-channel code punched paper tape.

From the tape-reader the 7-element signals are fed to a scanner, where they are translated from parallel to serial form. Error detection features are now inserted—a further five elements—so that composite 12-element characters are passed to the data transmitter. The input signals to the transmitter are fed to a modulator through a recorder, the output level changing whenever a '1' is fed into it; the recoder modulates with a line wave carrier of 1,500 characters per second and the output signals are amplified and passed to line.

The receiver converts signals from line to the corresponding binary square wave signal, when it can be fed through the code element stores, the 'start', 'stop' and 'no signal' code detectors, and parity check circuits, to the tape punch.

Marconi-tape-to-tape systems
Maker: Marconi Wireless Telegraph Co Ltd

This system permits the transmission of data from 7-channel paper tape reader to a distant tape-punch at 37 characters per second, over standard telegraph, speech or radio circuits.

The tape transmission is started by the TRT 'tape reading transmit' (TRT) signal to select the appropriate decoder at the receiver end; transmission then commences and continues until the end of the message, interrupted only by requests for re-transmission or failure of the parity check at the transmitter. The code drive feeds the information to the coder from the tape reader on a 12 or 16 character basis over 24 wires, each bit having one wire for either polarity. The information is checked in the coder using the parity bit, and if the code combination is inacceptable only supervisory signals are sent to line; if acceptable the coder converts the data in 8-unit code and passes the character to the output register. There the character is scanned under control of the bit distributor, and sent serially through the output card and modulator to line. At the same time as scanning takes place the character is sent in parallel to a shifting store where it is stored in one of the columns of a right-store matrix under the character selection; as the 'repetition request' is made or passed over at the receiver the characters are discarded; two, four, six, eight or 10 of the characters last sent will be stored, depending on the preset links of the selector. The received signals at the receiver are demodulated and fed to the decoder drive. The 8-bit sequential signal is converted via a 16-wire input to the decoder and the characters are scrutinised by the register and error detector. If error is detected the character is suppressed and the supervisory signal sent to the repetition sequence control. Transmission speeds can be 50, 75, 100, 200 or 300 bits per second, depending on the quality of the transmission circuit.

Error detection is based on a fixed rate, 8-unit code. The parity bit is checked prior to transmission and discarded at the transmitter, being re-inserted at the receiver, and the distant checking stage. If the parity check fails to apply transmission stops and a supervisory light appears at the transmitter; if error is detected at the receiver, an automatic request for re-transmission is received at the transmitter which closes the gate to transmission and brings in the stored characters for automatic retransmission until the signal is acceptable.

The Friden Teledata
Agents: Bulmer's (Calculators) Ltd

This system allows 5-, 6-, 7-, or 8-channel tape, produced as a by-product of Flexowriter typing (see Survey, January 1961) to be transmitted over switched public circuits or Tariff D and E private lines.

A Flexowriter could serve as the tape reader and would transmit either five channel or eight channel tape. It would connect up with the Teledata transmitter which converts the 8-channel coding suitable for sending over a modulating demodulating subset. Part of the teledata equipment is a punched tape code converter which converts 8-channel systems coding to 5-channel communications coding at a speed of 1,180 codes per minute. At the receiver end it converts the communications coding to system coding for transmission to a slave flexowriter, Teletype punch or other print-out devices.

The speed of transmission of the Teledata system is given as 651·4 codes per minute. Built-in accuracy checks prevent transmission or receipt of erroneous codes.

The Bendix Ericsson ETL Digital Data Link 430*A*
Maker: Bendix Ericsson (UK) Ltd

This system is a tape-to-tape system, which operates over private or ordinary subscriber lines at a rate up to 500 bauds. Depending on the quality of line used error correction procedures could be used with redundancies from 58 and 79 percent.

The transmitting unit consists of a photo-electric tape reader, operating at 25–100 characters per second; an error correcting encoder and a frequency modulator transmitter. The receiving unit consists of an amplifier and detector, an error correcting decoder and the output punch or other output medium.

The reader, which accommodates 5-, 6- or 8- channel tape, generates a clock pulse for synchronisation with the receiver. When synchronisation is achieved reading starts automatically.

Information from the tape reader is amplified and transposed into serial form by means of a shifting register whose shift rate is synchronised with the reader. A parity bit is inserted after each information bit, and a pair of synchronising bits after each group of 10 information and check bits.

The modulator, linked to a buffer amplifier, and transformer, transmits the information to the receiver. The signals are fed to the decoder which forms part of the receiver, which contains a counter drum activated by a multi-vibrator. The information is fed alternately to two shifting registers where the errors which may have occurred are detected and corrected by the parity and switching circuits, under the coding system.

The output from the system can be fed to a reperforator direct, if transmission is slow speed, at 25 characters per second, with 0·97 detection probability.

CARD-TO-CARD COMMUNICATION SYSTEMS

The IBM 065/066 *Data Transceiver*
Maker: IBM United Kingdom Ltd

The systems permit the reading and transmission of data from punched cards between two remote stations, using private voice channel tariff D and E lines. It is

anticipated that this equipment will eventually be used on public circuits.

The advantage of this system is that the information transmitted for the card may be ' edited ' during transmission by program cards routed at the transmitter and receiver, control wiring and by control punches in the card itself; in this way skipping or duplicating from the previous card, etc, can be determined, as well as the signal for releasing the card.

The transmission will be activated by a synchronising pulse signal, which is maintained throughout the operation. As each card is released the end of card signal is transmitted if the parity checks are met, the receiver will answer with a ' go ahead '.

The checking is by comparison of the characters read and punched. In the event of a discrepancy the cards at the transmitter and receiver end will be set aside for subsequent re-transmission by a successive card checking feature, or by the locking of the transmitter due to the absence of a ' go-ahead ' from the receiver. The card can then be examined and re-transmitted. Speed of transmission is given as up to 16 columns per second. The model 965 handles 80-column tabulating cards, and the model 966 edge-punched cards.

The Marconi card-to-card system
Maker: Marconi's Wireless Telegraph Co Ltd

This system is similar to that of the tape-to-tape system, allowing information to be transmitted between 80-column card readers and card punches over standard telephone or radio circuits.

The speed of transmission, from alpha-numeric or random punched cards, is approximately 25 cards per minute.

The starting button on the reader causes the reader to feed a card from the hopper. As the card reaches the first column position a signal ' card ready to transmit signal ' (CRT) is sent: two types of CRT are utilised, depending on whether cards are alpha-numeric or random punched, since the appropriate decoder of the receiver has to be selected. The CRT signal is answered by a ' card ready to receive ' (CRR) signal from the receiver, and transmission can begin.

In the case of alpha-numeric cards, error provision is made at the transmitter to prevent impossible combinations being fed in; this generates a ' reject and deface ' (RD) signal from the receiver, whereupon the card is rejected. As with the IBM system, column skipping is possible through the wiring on the plugboards at transmitter and receiver.

With alpha-numeric punching, when a single character is punched into each column of a card, a single 8-bit character is sent for each column; and one column of the receiving card is punched or each 8-bit character received. If cards at random are to be transmitted the holes standing in odd and even rows are read as two separate binary characters per each column. Both are individually converted into the 8-unit code and then sent one after the other. At the receiver, the reverse operates, the odd and even rows of each column being punched at two consecutive operations. Thus, two 8-unit characters are sent for each column, halving the card transmission speed, as compared with alphanumeric.

The same error detection system applies as for the Marconi tape-to-tape system.

MAGNETIC TAPE-TO-TAPE TRANSMISSION SYSTEMS

The IBM 7701 *Magnetic Tape Transmission Terminal*
Maker: IBM United Kingdom Ltd

This system is capable of transmitting data from IBM 727, 729 and 730 tape units via the terminal to a remote terminal by means of private tariff D or E voice circuits. The terminal could also communicate direct with a computer through the 1009 transmission unit.

The 7701 has built-in checks for the accuracy of data transmitted, both as to reading and writing of tape recorded information. The terminal will automatically cause faulty information to be transmitted three times, after which the terminal automatically stops.

The system operates at 150 characters per second, from tape reels of 200 characters per inch density.

COMPUTER-TO-COMPUTER COMMUNICATION

The IBM 1009 *system*
Maker: IBM United Kingdom Ltd

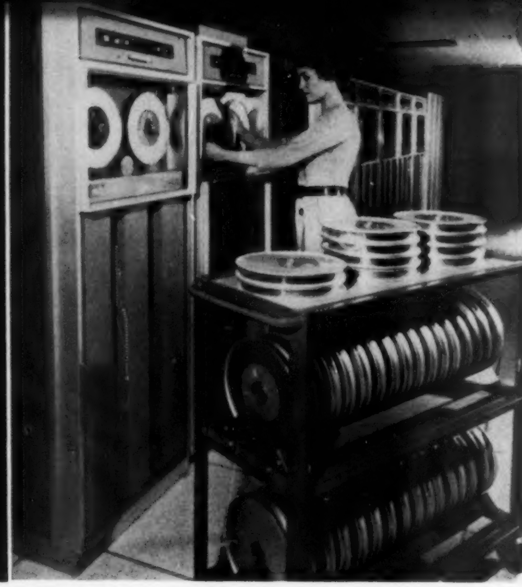
This system enables 1400 series computers to communicate on-line with each other. It utilises private tariff D and E circuits.

The system is capable of transmitting data at 150 characters per second, using either tape-to-tape or card-to-tape, or card to tape to output printer. Data are read into the specially assigned storage areas of the computer, and read out to the 1009. From there they are passed through a modulating subset that converts the information to line and transmits to a demodulating subset at the remote station; thence the information goes to the 1009, and under program control into the area of computer core storage selected. The information is automatically tested—for accuracy of the ' record ', the data group sent, and for individual character accuracy—at both ends of the transmission. Error detection causes automatic re-transmission of the record, the unit halting automatically after three unsuccessful attempts at transmission. The 1009 can also permit communication between the IBM 7701 and the 1401 computers at a speed of 150 characters per second.

At the commencement of the transmission cycle the stored programs are loaded at either end of the transmission link. Thereafter the line link is established through a telephone connection, and transmission can automatically begin.

WHAT'S NEW

in systems, services and equipment



New typewriter punches and reads

EXHIBITED for the first time at the Hanover Fair last month in prototype form, and likely to have its debut in this country at the October BEE, is the Olympia Olymax. This is an automatic typewriter which can be activated by an edge-punched card reader or tape reader (or both) producing a hard copy record and selected punched tape or punched card output. The basic unit—comprising reader, typewriter, and punch—is self-contained, and the units are housed in (or on) an office desk. However, the punch and reader are in fact fully independent, and any number of auxiliary punches, say Olympia, can be coupled up to the system to extend its scope; in addition, an auxiliary reading unit can also be connected.

The Olymax can be ' programmed ' to give control over tape reading and the keyboard; it uses standard 8-channel coded tape and cards input and output.

No sterling price or delivery time can be quoted.

For further information tick F01 on the reader enquiry coupon on page 43, or write to:

Olympia Business Machines Co Ltd,
35 Red Lion Square,
London, WC1.

Cartridge adapter speeds printer

THE use of a numeric chain containing 15 character sets—10 numbers and six special characters—instead of the customary alphanumeric chain of five sets of 48 characters, will enable the IBM 1403 to double its print-out speed. Since the chain speed for the numeric chain remains the same as for the alphanumeric, *ie.* 90 inches per second, the time taken for a character to reach the print position is substantially reduced.

This new method of printing is made possible by the use of an interchangeable chain cartridge adapter, which allows the operator to switch between alpha and numeric printing, by interchanging the chain cartridge or housing. Different type faces and sizes can be used simply by changing the print chain cartridge.

IBM say that this method will allow the 1403 to operate at a speed of 1,285 lines per minute, with variable line spacing up to 75 inches per second. This means that a 20,000 man payroll with gross earnings, deductions, net pay, department and individual number, can be printed out in about 18 minutes.

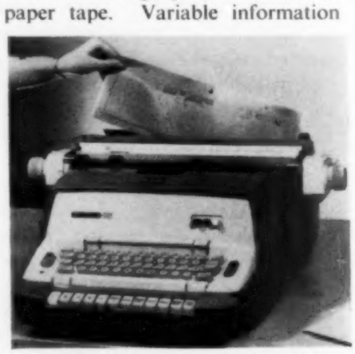
For further information tick F02 on the reader enquiry coupon on page 43, or write to

IBM United Kingdom Ltd,
101 Wigmore Street,
London, W1.

New programmed typewriter

EXPECTED in the country later this year after a successful debut in the USA, is the Smith Corona Marchant automatic writing system.

This system, known as the Typetronic 2215, accepts fixed information from edge punched cards or paper tape. Variable information



Mylar card programs typewriter

can be typed in manually on the typewriter keyboard, and the machine can be programmed to punch simultaneously selected data into edge-punched cards or paper tape. It is believed that an arithmetic unit can also be linked to the system to allow calculations to be made.

The equipment retails in the United States for just over $1,600 but no fixed sterling price has been given. It is understood that the equipment is to be marketed in Britain by Block and Anderson Ltd.

For further details tick F03 on the reader enquiry coupon on page 43, or write to:
Block and Anderson Ltd,
Cambridge Grove,
London, W6.

Strip Record

IN many scientific (and possibly some commercial computer applications) it is often desirable to have the results put out in graphical form in addition to the usual numerical print-out.

The logarithmic electronic strip chart recorder provides such a graphical print-out medium. It has a calibration accuracy of better than one percent, though to maintain a repeatable accuracy of 0.25 percent over the full scale the minimum span is restricted to 5 mV. The recorder has two slide wires fitted in the standard position, with the pen carriage fitted with two sets of slidewire contacts. In this way alternative logarithmic or linear response is possible. One slidewire for logarithmic response is included in the measuring circuit and is arranged in 12 linear sections each section having wire of different gauge or material. In this way the logarithmic law is obeyed, with a law accuracy of rather better than 0.4 percent.

For further details tick F04 on the reader enquiry coupon on page 43, or write to:
Honeywell Controls Ltd,
Greenford, Middlesex.

Centre for magnetic tapes

LOSS of information through areas of drop-out on magnetic tape is quite a problem where essential information must be captured and stored, and when data recovery in case of loss is difficult. Decca Radar are going some way to avoid this danger by submitting all their tapes to rigorous acceptance tests in a special tape testing laboratory.

Information loss can be caused by loose oxide particles on the tape surface, impurities, lumps of oxide, or pin holes. These irregularities are detected during repeated playbacks and the area of their incidence located. The tapes with limited rejection regions—areas where drop-out occurs—are classified as grade 2 tapes; only tapes with no reject regions can be specified as grade 1. This grading specification, for electrical and mechanical acceptance, is noted on the backing side of the tape of the tape leader as a coded serial number.

For further details tick F05 on the reader enquiry coupon on page 43, or write to:
Decca Radar Ltd,
Albert Embankment,
London, SE1.

Flexible input unit

A NEW data input keyboard, compatible with punched cards, punched tape and magnetic tape units, which can be used as a remote station input for computer or other digital installations, is being marketed by the Clary Corporation of California.

The unit is very simple and compact and consists of a keyboard with nine numerical keys and a '0' bar; also five control keys. The unit can accommodate up to 30 control keys if required, and also indicator lights.

The unit can be simply integrated in a computer installation without outside technical assistance, and can also be used in testing, data logging, check-out, and other digital routines.

Blackburn Electronics, who market the Clary Corporation equipment in this country, have not yet finalised plans for importing the equipment, which is described by the makers as 'low cost.' However, they say that they are examining its market potential, and will certainly import the equipment if there is a palpable demand apparent.

For further details tick F06 on the reader enquiry coupon on page 43, or write to:
Blackburn Electronics Ltd.
Brough,
Yorkshire.

Testing for data drop-out

Poor man's tape-to-card converter

A METHOD of linking a Flexowriter SPD to an ICT 30 card punch, thereby allowing punched cards to be prepared as a by-product of a Flexowriter operation, is announced by Bulmers. This 'missing link' equipment, known as the TCC (Tape to Card Converter) is a small free-standing unit about 30½ inches high and 10½ inches square. The unit is cable connected to the SPD via the output socket on the Flexowriter and to the punch keyboard via the keyboard socket. The TCC is then switched on—when switched off it can remain attached to the punch, which will operate as an independent unit—and will convert codes transmitted from the SPD into output pulses for card punch input.

The TCC operates in two states, 'All,' when the whole of the codes transmitted by the SPD are converted and punched; and 'Select' when punching in order control of a program tape, when only selected data is punched.

Gang punching, card skipping, ejection, etc, may also be initiated by Flexowriter instruction codes, subject to the plugging on the control panel.

Parity checks allow invalid codes to be detected, whereupon the Flexowriter keyboard and reader lock; this multi-locking also comes into force if a card gets out of step with the SPD, due to operator error.

A second converter, the TCPC, allows for the Flexowriter to link up with an IBM 024 or 026 card punch. The interconnection of both converters with their appropriate

card punch and Flexowriter can be carried out very simply, requiring only a small wiring change on the punch. The cost of the TCC and TCPC are both around £600, with a delivery period of some six months.

For further details tick F07 on the readers enquiry coupon on page 43 or write to:
Bulmers Calculators Ltd,
47–51 Worship Street,
London, EC1.

Card-operated print-out system

IN an article on the census of population in this issue (see page 8) mention is made of the IBM 858 Cardatype accounting machine. Though this machine was introduced into this country a little while back, its features and business applications are not widely known.

The Cardatype is a composite equipment consisting of an electric typewriter, a control unit, and an auxiliary keyboard. The unit will usually be geared to a card reader which acts under instructions from the control unit; it can be linked at the output end to a card or tape punch to produce punched cards and/or paper tape in addition to hard copy.

As used for census print-out

The system operates as follows: pre-punched and pre-verified 10-column punched cards are put into the reader. This reader operates under the control of a program unit and control panel, which prints information on cards at the rate of 10 columns per second, with 30-column per second skipping time. Constant information can be thus transmitted to the typewriter for automatic

No Bristles on Gillette

(continued from page 18)

so many different tasks almost simultaneously that we had it creating account receivable records in the form of punched cards immediately it finished printing an invoice; at the same time it reduced stock balances by the amount of goods on the invoice; recognised customers in terms of credit standing, passing those which were obviously first class and laying aside those which required additional checking by a human.

For our shipping department we calculated the weight of each one of the items which would appear on the invoice. We indicated to them the normal way that the goods should be shipped to the customers (since in the USA you have a choice of approximately six different methods the cost of which all vary with the speed of shipment, weight of shipment and nature of goods sent). After a little experience we also began to advise the shipping department of the most advantageous way to ship any back-log of orders, analysing them as to source and estimated date required and indicating that a full railway car to St Louis would be available in the third week of the month. Most important we were able to help the shipping department get the maximum amount of goods out of the Boston plant each day with minimum waste of time. Later, centralised warehousing out of Boston, which was one of our biggest troubles, was solved by decentralising the finished goods warehousing throughout the country with the result that stock control and stock reporting out of all the regional warehouses became most important. With the computer designating which warehouse was to be used for which customer's orders and producing five warehouse reports a day rather than one, in little more than the time it took to do one before, we began to feel quite happy with our 650.

Apart from this main task, a number of other jobs were put onto the machine—for example it was used to keep track of a company provident fund. The computer also took on some of our rather time-consuming and complex calculations of the value of work in progress throughout our company. Those of you who make your product in many little stages and use a standard cost system will know that I am not exaggerating when I say that we reduced a 3-day job to seven minutes. Little by little the 650 was nibbling away at the edges of our accounting problems and managed to be quite successful each time it was used. These experiences and further research lead us to thinking about the true integrated processing problem which previously would have been only a faint hope or dream. By this time we had almost fully loaded our 650 on a one shift basis and had quite a number of overtime jobs for it requiring additional time.

It was about this time that IBM announced their 7070 computer, and shortly thereafter the 1401 computer system, either as a separate or an integral part of the 7070 system. Thus we found that we had located the answer for Gillette for at least the next five or six years and we have ordered (and since received) a combined 7070–1401 system. The IBM 7070 has replaced the present IBM 650 equipment plus certain conventional equipment and on that basis alone will enable us to break even. It will meanwhile give us tremendous power and storage capacity far beyond the capabilities of the 650. The 650 helped us nibble away at the edges of our business information problem. The 7070 will within three to four years be doing all the accounting and operating information handling in Boston.

typing at a speed of 10 characters per second.

In addition to printing data automatically under the control of the card reader, variable numerical data can be keyed in by an operator. This numerical information can be keyed in and not released to the receiving units on the typewriter until the appropriate moment.

The automatic carriage of the typewriter prints controlled spacing within and between forms, and print-out can be in both upper and lower case with ribbon change, if required. Variable alphabetic and numeral data can be transmitted, where appropriate, to slave typewriters or ancillary card or tape punches.

An additional auxiliary keyboard can be added to expand the system, and also up to three electric typewriters. In addition the card readers can be programmed to pick two types of codes simultaneously, in step with the print-out of a single document. Also, where addition and multiplication are required as part of an operation, an arithmetic unit can be attached to the basic installation.

For further details tick F08 on the reader enquiry coupon on page 43 or write to:
IBM United Kingdom Ltd,
101 Wigmore Street, London, W1.

Add-lister for data transmission

A SOLENOID-OPERATED adding-listing machine, which can print out numerical data received over telephone wires at more than 10 characters per second, and automatically compute and remove check totals, has been jointly developed by British Olivetti and Ultra Electronics.

Keys on the machine—a converted Elettrosumma 22—are operated under control of punched tape, punched cards or magnetic tape readers, and all results, together with optional factors, are printed out on a tally roll. The machine can be connected up to a transistor amplifier if used with low level inputs, and with ancillary data reader equipment for converting input tape data into electric impulses.

Add-lister on the wire

The add-lister can be either a 12-digit decimal-only machine, with a maximum total comprising 13 digits; or a combined decimal-sterling model with eight digits of decimals and total with nine digits, and recording up to £99,999,999-19-11, with a total of £999,999,999 19s. 11¾d. When not used with the solenoid it can be operated manually, and can be linked to card or tape punches to do ordinary accounting routines.

The cost of the Ultra-Elettrosumma 22 is given as £175, and delivery is ex-stock.

For further details tick F09 on the reader enquiry coupon on page 43, or write to:
Ultra Electronics Ltd,
Western Avenue, Acton, W3.

TEAR HERE

TEAR OR CUT HERE

NEW EQUIPMENT—READER ENQUIRY SERVICE

Use this reply-paid form to obtain more details on any products reviewed in the What's New Columns of this issue.

(Readers outside the United Kingdom will need to add their own postage stamps)

PLEASE TICK AGAINST THE REFERENCE NUMBERS

F00...✓..........	F01..........	F06..........	F07..........	F12..........	F13..........
F02..........	F03..........	F08..........	F09..........	F14..........	F15..........
F04..........	F05..........	F10..........	F11..........	F16..........	F17..........

Your Name ....
(PLEASE USE BLOCK LETTERS)

Position ....

Name of Firm ....

Address ....

NEW SUBSCRIBERS

If you are not already a personal subscriber to ADP and would like to read your OWN COPY more thoroughly every month, complete the statement below.

To the Sales Director, ADP

Please send me a personal copy of ADP every month for the next 12 months, starting with the.................... issue. Send the account to my firm/me personally.

Name ....
PLEASE USE BLOCK LETTERS

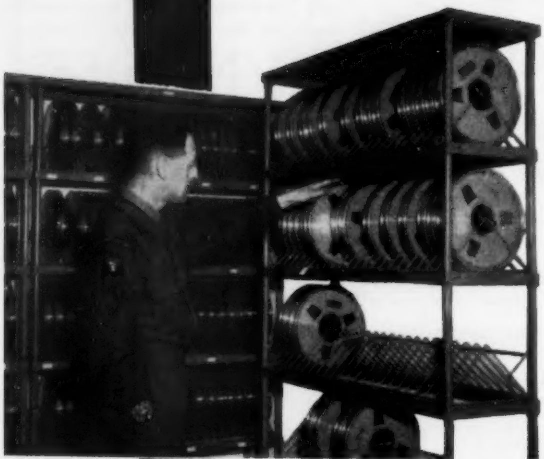
Position ....

Name of Firm ....

Address ....

....

PCA JOINS THE ARMY!



Already doing stalwart service at the Electronic Accounting Development Unit of the Royal Army Pay Corps at Worthy Down, are ranks and files of the new PCA STORMOST Computer Tape Racking System, giving safe storage, combined with easy access, to the vital and vulnerable IBM Computer Tapes in daily use.

STORMOST—designed for use in full air conditioning—is supplied with Insert Units to house every size and type of Tape or Film. It can be extended vertically and linked laterally to give complete flexibility of lay-out and capacity. Counter-height Assemblies are supplied with Warerite working tops.

★ *For full details of* STORMOST *and other PCA Data Processing Accessories, please apply to ....*

PUNCHED CARD ACCESSORIES LTD. 58 VICTORIA STREET, LONDON, S.W.1 TEL: VIC 7891. 3 lines

TEAR HERE

FIRST FOLD

FOLD AND TUCK IN

SECOND FOLD

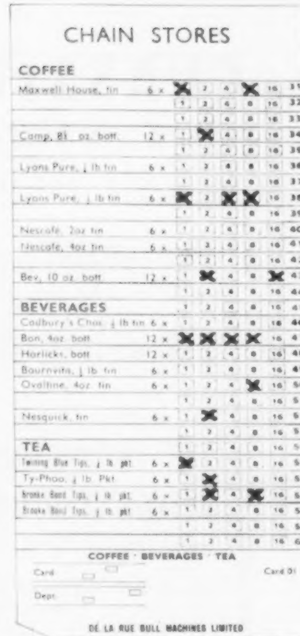
No Postage Stamp necessary if posted in Great Britain or Northern Ireland

Postage will be paid by Licensee

BUSINESS REPLY FORM
Licence No. K.E. 1731

AUTOMATIC DATA PROCESSING
Reader Service Department,
Mercury House,
109-119 Waterloo Road,
LONDON, S.E.I.

TEAR OR CUT HERE



CHAIN STORES

COFFEE							
Maxwell House, tin	6 x	X	2	4	X	16	31
		1	2	4	8	16	32
		1	2	4	8	16	33
Camp, 8½ oz. bott.	12 x	1	X	4	8	16	34
		1	2	4	8	16	35
Lyons Pure, ¼ lb tin	6 x	1	2	4	8	16	36
		1	2	4	8	16	37
Lyons Pure, ½ lb tin	6 x	X	2	X	X	16	38
		1	2	4	8	16	39
Nescafé, 2oz tin	6 x	1	2	4	8	16	40
Nescafé, 4oz tin	6 x	1	2	4	8	16	41
		1	2	4	8	16	42
Bev, 10 oz. bott	12 x	1	X	4	8	X	43
		1	2	4	8	16	44
BEVERAGES		1	2	4	8	16	45
Cadbury's Choc. ½ lb tin	6 x	1	2	4	8	16	46
Bon, 4oz. bott	12 x	X	X	X	X	16	47
Horlicks, bott	12 x	1	2	4	8	16	48
Bournvita, ½ lb tin	6 x	1	2	4	8	16	49
Ovaltine, 4oz. tin	6 x	1	2	4	X	16	50
		1	2	4	8	16	51
Nesquick, tin	6 x	1	X	4	8	16	52
		1	2	4	8	16	53
TEA		1	2	4	8	16	54
Twining Blue Tips, ¼ lb. pkt	6 x	X	2	4	8	16	55
Ty-Phoo, ¼ lb. Pkt	6 x	1	X	4	8	16	56
Brooke Bond Tips, ¼ lb. pkt	6 x	1	X	4	X	16	57
Brooke Bond Tips, ½ lb. pkt	6 x	1	2	4	8	16	58
		1	2	4	8	16	59
		1	2	4	8	16	60

COFFEE · BEVERAGES · TEA

Card — Card 01

Dept

DE LA RUE BULL MACHINES LIMITED

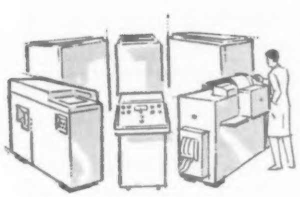
data processing links the chain . . .

. . . between branch and warehouse, between order and goods. The link is forged by De La Rue Bull. It offers a greatly improved method of receiving and despatching orders without the frustration of error and delay. Stock records, too, are maintained with up-to-the-minute accuracy.

The system is new — an ingenious demonstration of punched card versatility. New because every card has a dual role. First, as a pre-printed order sheet on which quantities required are marked simply by a series of crosses. Secondly, after automatic magnetisation and punching of these marks, as the computer input medium.

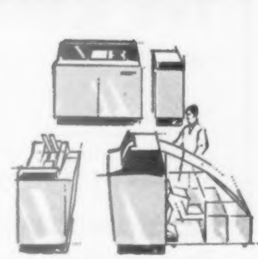
The computer will then produce *in one single progressive operation:*

INVOICES · DESPATCH LISTS · STOCK ISSUE SUMMARIES
NEW STOCK STATEMENTS · RE-ORDER LISTS



THE GAMMA 3 COMPUTER (*left*)
is an electronic calculator with variable drum storage of up to 200,000 decimal digits. With a basic on-line printing speed of 150 lines per minute, invoicing and its associated operations can be carried out as a single integrated process.

THE 300 D.P. SERIES (*right*)
is an expansible unit system, fully synchronised at a speed of 300 cycles/lines a minute: though rates of reading, calculating and printing may be increased by using further units. Storage is available in the form of a magnetic drum or tape units.



DE LA RUE BULL MACHINES LIMITED

114/118 Southampton Row, London W.C.1. Tel: CHAncery 5725

Gamma 3B **300 DP Series** **Gamma 60**

BM22b

CLASSIFIED ADVERTISEMENTS

RATES: APPOINTMENTS VACANT & OTHER CATEGORIES, 3s. 6d. per line (minimum 3 lines), 40s. per display panel inch. APPOINTMENTS WANTED, 3s. per line. 35s. per display panel inch. Box No. charge, 1s. extra. Address advertisements to The Classified Advertisements Manager, "Automatic Data Processing," 109–119 Waterloo Road, London, S.E.1. Tel.: WATerloo 3388 (Ext. 32).

RTB

DATA PROCESSING

Richard Thomas & Baldwins, a large steel company, is rapidly developing its punched card installations in various sections of the Company. All the installations use electronic calculators. Studies are also well advanced on the improvement of information systems and suitable applications for digital computers.

The Organisation and Methods Department requires a man around 30 years of age, with considerable practical experience of punched cards. As the post will involve participation in computer studies the ability to do systems work is also important. A degree or accountancy qualifications would be an advantage.

The Department is based at Ebbw Vale and Newport in Monmouthshire, but limited travelling to other locations will be necessary.

This appointment should prove challenging to a man of initiative. The salary, prospects and conditions of employment are excellent.

Applications should be sent to: Manager,

RICHARD THOMAS & BALDWINS LIMITED
Organisation and Methods Department,
47 Park Street, London, W.1.

BP

COMPUTER STAFF

BP are now ordering their third computer for operation in their Head Office in London. Immediate opportunities arise to join a team to work on the investigation, planning and programming of commercial and accounting applications on this machine. Applicants should have a University degree or equivalent professional qualification, or have had wide experience of systems analysis, organisation and methods or punch card planning. Particular consideration will be given to experienced programmers; training courses will be arranged where necessary. Salary according to age, qualifications and experience. Non-contributory Pension Fund. Removal and settling-in allowance payable in certain cases. Luncheon Club. **Write, quoting reference E.D.P.1, to Box 6641, c/o Hanway House, Clark's Place, E.C.2.**

AUTOMATIC TELEPHONE & ELECTRIC COMPANY LTD.,

Electronic Data Handling

The Company is engaged upon the development of large data handling systems involving a variety of techniques, from computing to data presentation. Progressive vacancies occur in the following categories:

System Engineers

Education in light current electrical engineering to degree standard or equivalent is preferred. Experience in data handling techniques and/or logical design and the ability to interpret and assess customers' facility requirements in terms of system capability are of primary importance. The work requires a considerable amount of customer liaison and close co-operation with circuit design engineers.

Programmers

Electrical Engineers or mathematicians qualified to degree standard or equivalent. Experience in programming digital machines and an interest in 'logical decision' programming, rather than pure calculation, is desirable. Close co-operation with system designers and the ability to achieve a grasp of the system function and principles are a necessary part of the work.

If you are interested in this class of work please write to:

The Personnel Manager,

AUTOMATIC TELEPHONE & ELECTRIC CO. LTD.,

Strowger Works, Edge Lane, Liverpool, 7

giving details of age, qualifications and experience, and quoting ref. EDH.

Posts are on the Company's established staff with superannuation scheme and full welfare facilities. Assistance with housing will be given in approved cases.

SEE ALSO ADVERTISEMENTS OVERLEAF

INDEX TO ADVERTISERS

Printed for the Proprietors, BUSINESS PUBLICATIONS Ltd., *registered office: 180 Fleet Street, London, E.C.4, England* (*Waterloo 3388*) by The Alcuin Press, Welwyn Garden City, Herts.
Advertisement, editorial and sales offices: 109-119 Waterloo Road, London, S.E.1 (Waterloo 3388)